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The Mechanical Engineers.

We continue from last week (page 808) the report of the Forty-Second Meeting of the American Society of Mechanical Engineers. The total attendance, 759, was somewhat greater than that of last year's meeting, which also was large. The proceedings of Tuesday evening and the election of officers were referred to last week. Extracts of five papers were also published and extracts of some other papers appear in this issue.

Wednesday.

On Wednesday morning the annual report of the Council was received. It was stated therein that for the time being it was not advisable to enlarge the Society's house on 31st street, and that the Council had therefore installed a better system of ventilation.

Notice of the appointment of Mr. Gus C. Henning as representative of the Society to attend a council meeting of the International Association for Testing Materials at Zurich, Switzerland, was given.

A request from the management of the engineering congress to be held next August in Glasgow, was complied with by the appointment of the following representatives on a general committee: Messrs. S. T. Wellman, C. H. Morgan, George W. Melville, Sir Benj. Baker, James Dredge, W. C. Unwin, H. F. Parshall, Philip Dawson, Bryan Donkin, H. F. L. Orcutt, O. H. Baldwin, and Alex. Sahlin.

It was decided to appoint no committee on valuation of water power privileges and the subject is for the present dropped.

The Society was requested to co-operate with certain other national bodies, to secure the establishment of a national standards bureau, in connection with the United States office of standard weights and measures, which should be made a central point for the calibration and standardization of scientific and engineering apparatus. The council accepted this invitation by appointing Mr. Jesse M. Smith the chairman of a committee, but has not completed the full appointment.

The tellers reported election of 44 members, nine associates, 41 juniors and the promotion of five persons to full membership. The report of the Finance Committee showed a satisfactory condition, not the least important feature of which was the cancellation of the second mortgage of $32,000 against the 31st street property.

Mr. Henning, of the Robert Fulton Memorial Committee, reported $1,450 collected or pledged for the erection of a monument and said that if this sum could be raised to $2,000 that amount would be adequate for the erection of a creditable monument.

The committee on "Standard Proportions for Pipe Unions" reported progress and was continued for conference with the Master Mechanics' and Master Car Builders' Associations.

Mr. H. de B. Parsons' paper, "Comparison of Rules for Calculating the Strength of Steam Boilers," (see *Railroad Gazette*, p. 807), the first to be discussed, brought out a wholesale condemnation of the U. S. Government rules for boiler work. Early in the discussion Mr. William Kent seemingly voiced the spirit of the occasion by saying that at present it were better to conform to foreign rules or to those of the American insurance companies and to disregard the U. S. Government rules as practically worthless. Pointed criticism of inactivity at Washington on the part of those upon whom the duty of revision of the rules devolves was not lacking. The suggested appointment of a committee to formulate universal rules met with cordial support from all speakers. It was further suggested that the committee be made international and that care in operation, and inspection of boilers while being built, be made factors for the committee to deal with, and that these points as well as designing be given due importance.

Mr. Parsons closed the discussion by enlarging upon some essential features of the subject. His remarks were, in effect, that as matters now stand it is possible to build boilers to conform to some existent rules and to have them explode while working under duty requirements; rules had not kept pace with the times. It was believed possible to organize an international committee and eventually to adopt universal rules. A resolution was passed looking to the appointment of a committee that should review the general situation and report to the Society for the furtherance of the adoption of uniform rules.

EARLY HIGH-SPEED ENGINEERING.—CHARLES T. PORTER.

The meeting of the Society, following closely upon the death of Mr. John F. Allen, seems a fit occasion for some reminiscences of Mr. Allen and of the infancy of high-speed steam engineering. Mr. Porter's business and personal relations with Mr. Allen were of the most intimate character. Their first meeting was in the winter of 1860-61. This first acquaintance of Mr. Porter and Mr. Allen came about through the inspection of a pair of beam engines operating in a factory in New York, with the valves of which trouble had been experienced. Mr. Allen, the newly-appointed engineer, had succeeded in making satisfactory adjustment. It was in the engine-room at this place that Mr. Allen drew, in diagram, with chalk, on the floor, his idea of a variable cut-off for positive movements, which he thought would eliminate existing objection in liberating valve gear. This rude sketch was comprehensive enough to fairly represent the matured system as we know it. In this connection Mr. Porter takes occasion to remark that which has been so often said of Mr. Allen, namely, the thoroughness with which details were grasped and provided for.

As a result of the interview referred to came the intimate association of Mr. Allen, Mr. Porter and Mr. Charles B. Richards, now Professor of Mechanical Engineering in the Sheffield Scientific School, Yale University, who then had an office on Nassau street, as mechanical expert and designer of machinery. Together they worked on Mr. Allen's idea of a positive-motion gear which would enable the governor to better control the point of cut-off. Mr. Allen's original idea in this connection grew out of his experience as engineer on a Sound steamer, running between New York and Providence, driven by a Corliss engine. The racing of the engine when the propeller was thrown out of the water had impressed the matter upon him and he in some measure over-estimated its importance as applied to stationary engines where spasmodic effort is absorbed and measurably controlled by the inertia of a flywheel.

In analyzing the subject and dealing with what was then a high-speed engine and eventually with high-speed engines, even as they are known to-day, it became apparent that a steam indicator would be absolutely necessary. There was at this time but slight use made of the indicator, and the only one that was recognized was the McNaught. Continuing, Mr. Porter recites the development of the Richards indicator, and the Allen valve, in connection with the Porter governor, and gives diagrams taken in 1861 from the first Allen engine with the first Richards indicator. This engine had cylinders 6 in. x 15 in., and made 160 revolutions per minute. There is a diagram taken from the Allen engine, with the Richards indicator, as they had been developed in 1862, and were shown at the International Exhibition in London; and also diagrams from the Allen engine, built by the Whitworth Company, of Manchester, England, and exhibited at the Universal Exposition in Paris in 1867. This engine had cylinders 12 in. x 24 in. and ran at a speed of 200 r. p. m.

Mr. Allen's suggestion of inclining the tubes of a water tube boiler is also given due value in its relation to the development of water tube boilers at the present time. In 1871 Mr. Allen sold out his interest in the engine business, and for a time devoted himself to the development of a pneumatic riveter and air compressor.

Reference is made to Mr. Allen's well known locomotive valve, which was treated in a paper by Mr. Quereau at the Washington meeting of the Society. Mr. Porter states, in reference to that paper, that the value of balancing valves, particularly in locomotives, was always fully realized by Mr. Allen.

In justification of the name Porter-Allen, by which the engine is now so well known commercially, Mr. Porter states that upon the retirement of Mr. Allen, in consideration of his own intimate association and applied energy in the conception and design of this engine, he felt that it would be not only advisable but justifiable to so name the engine. The paper closes with the following paragraph: "In my intercourse with Mr. Allen I was always impressed with the depth of his penetration and the general soundness of his judgment. He lived in a region of engineering and mechanical principles with which his familiarity was certainly intuitive. Deprived of all early advantages, the world gave him nothing, but he will be counted among those who have given much to the world."

Mr. Porter's paper, an extract of which is here given, was presented by the writer and brought out no discussion except of a general character. Dr. R. H. Thurston gave some reminiscences of Mr. Allen and some history of the early years of the steam engine indicator. Among those to whom he paid tribute for the development of high-speed engines he placed Mr. Porter first as to engines and Mr. Allen as leading the advance on valve design. Following the remarks of Dr. Thurston a member said Mr. Porter was too modest in permitting the name "Tangye" to apply to a form of engine bed that was originated by Mr. Porter, and which is distinctly Mr. Porter's idea; suggested that the influence of the Society be used to have this name "Tangye" changed to read "Porter," wherever that end can be attained.

"The Steam Turbine the Engine of Maximum Simplicity and of Highest Thermal Efficiency," by Dr. R. H. Thurston (see *Railroad Gazette*, p. 808) was read by reference to its principal points, with running comment, by the author. It was stated that for engines of the same power the cost of operation is now slightly in favor of the reciprocating engine; that turbines are peculiarly suited to high speed and constant load; that there is practically no limit to the speed, and that there is no back pressure loss to be considered; that to avoid fluid friction the use of dry steam is highly desirable for turbine operations, and finally that it is a form of steam motor worthy of careful study.

In the discussion by others the comparative weight, methods of reversing, direct and indirect propulsion of screw propellers, and the exacting work required to make turbines, and consequent expense, came in for further consideration. The discussion in its complete form will be found interesting and of value, although the definite conclusion expressed is that, as yet, there is much of conjecture in regard to the ultimate usefulness and economy of the steam turbine.

CENTRIFUGAL FANS FOR CUPOLAS AND FORGES.—WM. SANGSTER.

The writer of this paper believes that adaptation of this class of machinery to the individual conditions of each installation is of the utmost importance, it being impossible to establish a fixed rule by which the total field may be covered. There are formulæ offered for computing the power required by centrifugal fans in cupola and forge service which are said to be fairly reliable with possible errors held to the safe side. Under the head of cupola fans the amount of air required to melt one ton of iron is assumed to be 40,000 cu. ft.; this for cupolas that melt from six to eight tons an hour. The formulæ as given are expressed in unit terms of one ton of iron melted per hour with a blast pressure of one ounce per sq. in.

Assuming that a cubic foot of air at atmospheric pressure, temperature 50 deg. Fahr., weighs .078 lbs., the height of column of air corresponding to a pressure of one ounce per square inch is established at 1,154 ft. The velocity in feet per minute due to that pressure is taken to be 5,160 ft. On the basis of 40,000 cubic feet of air per ton of iron melted per hour the area of the orifice to deliver this amount of air at one ounce pressure is fixed at 18.6 sq. in. From these factors the horse-power per ton melted per hour, allowing for friction of belting and air in pipes, is given as .3 h.p. To obtain the horse-power required by a cupola fan the formula is given as follows: H. P. equals 0.3 TP, in which T equals tons of iron melted per hour and P equals pressure of blast in ounces per square inch.

For ordinary forced fires supplied by forge fans an allowance of 140 cu. ft. per minute is said to be ample, the usual blast pressure being about 4 ounces per square inch. For this work an estimate of ¼ h.p. per forge is given. For successful operation of smoke exhausts in forge shops it is said that four times the amount of air supplied by the blast should be taken out by the exhaust fan; that the fan should be driven at a peripheral velocity corresponding to a pressure of ¾ ounce per square inch, and that a total allowance of .44 h.p. per forge is sufficient.

The rest of the paper is given up to the consideration of the relation of outlet pressure to outlet area, accompanied by a diagram that is plotted from research of the writer and from a paper by Mr. H. I. Snell (*Transactions* American Society of Mechanical Engineers, Vol. IX., page 51) in which results from tests on centrifugal fans were given. In the present diagram the results given by Mr. Snell have been corrected to a uniform speed of 1,490 r. p. m., and plotted in comparison with other lines which represent the work of the writer.

At the Wednesday evening session Mr. Sangster's was the first paper presented. Extracts of it appear herewith. It was dwelt upon by the author, points being selected as illustrated by diagrams. The central thought was that of showing the direct and costly effect of overloading small fans.

A written discussion by Mr. H. I. Snell gave the detailed results of a practical test of a cupola; he pointed out the great element of uncertainty in making calculations, such as those contained in the paper of Mr. Sangster; thought the assumed blast pressures were too great; drew attention to the radical change of all other factors in the blast problem when the assumed volume of air is changed; stated that from his experience he felt that little is definitely known and that much difficulty exists in ascertaining the points intended to be met by the paper. There was no further discussion.

POWER PLANT OF THE MASSACHUSETTS GENERAL HOSPITAL.—F. W. DEAN.

The author describes a combined plant for the Massachusetts General Hospital and the Massachusetts Charitable Eye and Ear Infirmary, of Boston, recently designed by the firm of which he is a member. The hospital will probably be doubled in capacity in a few years. The

infirmary is new and has been occupied about a year and a half. The growth of the latter institution is expected to develop more slowly. The old steam plant occupied ground which was needed for the extension of the hospital, and it was insufficient for the enlarged hospital and the new infirmary.

It was found expedient to place the steam plant at one end of the property, although the two institutions are at opposite ends of it. Exhaust steam is carried 800 ft. from the engine room to the infirmary for heating purposes, arrangements being made to reinforce it with reduced live steam when necessary. The provisions made against water-hammer in pipes, particularly in the ward supplies, are interesting. These arrangements are treated in detail, and the plant, as a whole, is well illustrated in the paper.

The floor level of the boiler and engine rooms is 9 ft. below the surface of the ground and a coal pocket, capable of containing about 100 tons, has its floor on the engine room level. Coal is dumped directly into this from carts and is served to the boilers over a track scale upon which small iron cars are run. Vertical boilers, the crown sheets of which are 8 ft. above the grates, are used with good results in smokeless firing. A hydraulic elevator lifts ashes from the engine room to the ground surface. There are two feed pipes for each boiler, one being for the main feed and one for the condensation returns, the intent being that the snapping of pipes, when feeds of different temperature are mixed, shall thus be avoided. A double Green economizer is used. The interior of the lower part of the chimney contains a spiral stairway leading to the ground level and the floors above, this arrangement being possible because the smoke flues enter the chimney at a higher point.

In the pump room there are a duplex vertical Blake feed pump, a horizontal Deane duplex automatic return pump and receiver, with outside packed plungers, a Wainwright feed water heater, a Worthington hot-water meter, and various traps. Nearly all of these pieces of apparatus are arranged to be isolated for repairs. In the engine room there are three Ames horizontal simple non-condensing engines. Two of them are 15 in. x 14 in., and one 11 in. x 12 in. The larger ones are directly connected to 100 kilowatt Walker generators, and the smaller to a 50 kilowatt Walker generator. Each of the larger engines and generators is large enough for the night load, and therefore this important part of the plant is duplicated. The smaller set is right for the day load, and of course either of the larger sets can duplicate this during the day time. The exhaust steam can be passed directly into the heating system, or through the feed water heater and then to the heating system, or through the heater and then to the atmosphere, or directly to the atmosphere. In the winter the exhaust can all be used up without using the heater, and then the feed is heated by the economizer only. An oil separator is inserted in the main exhaust pipe before it reaches the heater, and after it leaves the heater a steam separator is inserted to keep back as much of the moisture formed in the heater as possible. This is done in order to remove all conceivable causes of water-hammer. The exhaust connection to the atmosphere is automatically controlled by a back-pressure valve provided with a dash pot.

Mr. Dean's paper, of which we give a close condensation, proved a surprise, it is safe to say, even to its author. The subject was, on the face of it, one that is thought to be pretty thoroughly digested, but it brought down a storm of criticism, oral and written, that will be found to include pretty nearly everything from a coal bin to a short circuit; a valuable discussion, in that it drew from the experience of many members and thus brought about the recital of quite up-to-date operations. This was especially true of methods of piping, the use of electric current in hospitals, and kindred matters.

Written discussions were received from Messrs. E. B. Katte, E. A. Darling and W. D. Ennis. Mr. R. P. Bolton gave liberally from his experience in New York practice. Mr. G. I. Rockwood described a plant he installed, and compared it with the plant of Mr. Dean's paper; discussed the merits of flanged joints; spoke of the desirability of concentrating responsibility in one man when work, of whatever magnitude, is to be done; ran afoul of Mr. William Kent on the latter proposition, Mr. Kent maintaining that the "one man idea," as set forth by Mr. Rockwood, was "the worst piece of heresy that has ever been voiced on this floor."

The discussion was pithy, to say the least. Much of the criticism was hostile to Mr. Dean's plant until, in closing, he stated some governing conditions that made out a very good case.

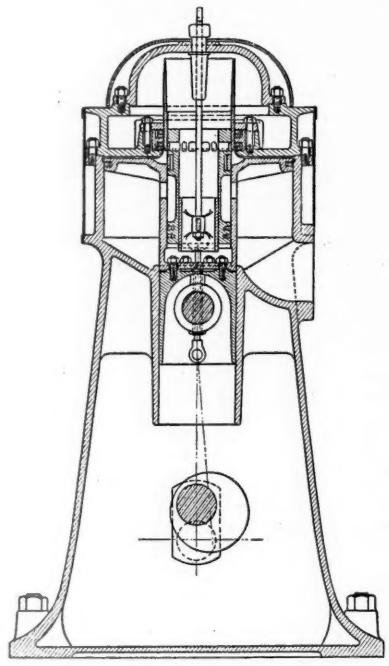
THE CONSTRUCTION OF CONTRACTS.—REGINALD P. BOLTON.

Mr. Bolton criticises very severely the so-called "uniform contract" adopted and recommended by the American Institute of Architects and the National Association of Builders. This form of contract is printed with his paper. He finds it a very lame and amateur affair and suggests a form of contract which he thinks would be more acceptable to engineers and contractors. The paper is one which cannot profitably be treated by abstract, but those who are interested in the subject should read it in full.

Mr. Bolton's paper, which we have here outlined, was discussed at considerable length and unearthed much feeling on the part of members. The present forms of contracts, as commonly executed by architects, engineers and contractors are apparently found by members to be quite open to charges of unfairness and useless verbiage. Reduced to its least dimensions the discussion urged that more candor is desirable; also less of mere wording that will not hold legally, and more of a spirit of concession by each party to the contract, to the recognized rights of others concerned. It was intended to limit this discussion to periods of five minutes, but it proved to be of so much interest that it greatly overran the intended limitation.

AN AMERICAN CENTRAL VALVE ENGINE.—E. T. ADAMS.

The engine whose valve gear is here described represents an effort to work up the old central valve idea in a form which shall retain the high economy of the English design, but which shall also meet existing American conditions and conform to safe American practice. This has led to so much that is new, and combinations so widely different from those adopted by Willans, that the designer feels that the title, "An American Central Valve Engine," is entirely justified. The engraving is a section taken through the low-pressure cylinder at right angles to the shaft. It is intended to illustrate the action of the valve gear, and does not show the actual construction of the engine as a whole. As shown in the cut, the low-pressure crank is on its upper center, and the main valve is open by the lead. The course of the steam at this instant is from the space above the cylinder head down through the hollow piston rod and the ports in the main



American Central Valve Engine.

valve to the upper side of the piston. On the return stroke the valve will open a passage between the two sides of the piston, and the exhaust simply passes from the space above the piston to the space below it. On the low-pressure side the latter is in communication with the exhaust; on the high-pressure side it forms part of the receiver. The main valve is a balanced piston valve, driven by fixed eccentrics on the crank-pin, hence the valve has a motion relative to the hollow piston rod, which is proportional to the throw of the eccentric, and both valve and rod have a motion relative to the frame, proportional to the length of the crank. The former motion controls admission, release and compression; the latter controls cut-off.

The main valve is designed chiefly with reference to the clearance. In the sketch submitted, the stroke is short and clearance is about 3 per cent. The main valve is designed to release very late in the stroke, and to compress to usual receiver pressure, hence the main valve will have a fixed cut-off at ¾-stroke or later. This, however, is merely a secondary cut-off, a safeguard against leakage through to the exhaust. Cut-off proper takes place at practically full piston speed, when the ports in the main valve run behind the stationary cut-off sleeve, and variation in cut-off is secured by adjusting the height of this sleeve. Evidently the cut-off sleeve has this in common with the ordinary throttle valve. It is stationary when the load is constant, and only needs adjustment when there is a change in load. Hence, the two may be controlled by the same regulator, and if they shall be so combined and adjusted that fixed cut-off shall never be earlier, and the throttling action of the valve shall never extend later than that point of cut-off which affords maximum economy, say ¼-stroke, we secure the ideal system of steam distribution for an engine subjected to variable load, with the further practical advantage of a high-speed engine without any high-speed rocker arms and other flying parts in its regulator connections.

Mr. Adams' paper, of which illustrated extract is here given, brought out a limited discussion, both written and verbal, the general tone of which was that of inquiry and guarded commendation. Among those who thus commented were Prof. Thurston and Mr. Scheffler. Some oral discussion of the subject closed the Wednesday evening session.

Thursday.

The Thursday morning session was held in the large lecture room of Havemeyer Hall, Columbia University. Prof. F. R. Hutton delivered an address of welcome and defined the status of the University, chiefly from the engineering standpoint. There was a large attendance.

Mr. Max H. Wickhorst's paper, "A Mechanical Integrator Used in Connection with a Spring Dynamometer" (see *Railroad Gazette*, p. 807), was first on the day's list and developed some 15 minutes of discussion. The trend of discussion was chiefly along the lines of fitness and reliability of the instrument for practical railroad work, the points of abstract that we published last week being closely followed.

The paper of Mr. Carleton A. Read, "Apparatus for Dynamically Testing Steam Engine Indicators," was next taken up. Additional points were rendered by the author from passages selected from the paper. Prof. D. S. Jacobus discoursed on methods of calibration, and in criticism of the mode of equipping the instrument. These remarks were illustrated by crayon sketches and led to a valuable general discussion on the care, calibration and use of indicators. The effect of cramped springs received consideration, and attention was also given to the value of lubricating the indicator piston. The opinion that oiling the piston was unnecessary was tentatively advanced by one member, but we did not hear any resolution passed looking to the abandonment of such use of oil.

Mr. W. H. Bristol's "New Recording Air Pyrometer" (see *Railroad Gazette*, p. 808) was shown in working model operated by the author and an assistant. The apparatus was a most interesting exemplification of the paper, and, in the hands of its inventor, was one of the most interesting subjects that came before the meeting. The practically available field and the technical accuracy of the instrument, so far as these have been established, were outlined. The bulbs of the instrument had been submerged in molten lead and withstood the test; had broken when immersed in molten aluminum, but the cause of breaking was not certainly known; it was not yet known whether the heat of molten brass was within the range of the instrument's endurance. The paper will have its greatest value when read in connection with complete discussion.

"Comparative Value of Different Arrangements of Suction Air Chambers on Pumps," Mr. F. N. Wheeler's paper, was presented and discussion was suspended until an address by President Low, of Columbia University, had been received, and response made by Dr. Thurston, by request of President Morgan, for the Society.

The discussion of Mr. Wheeler's paper was brief but valuable. It had to do with ready intake and discharge, of course, but gave advice on location of the air chamber and forcibly showed some results of misplacement of the chamber. The discussion was led by Messrs. Wheeler, Thurston and Bolton, and the contentions of the paper were afterward nicely demonstrated by a small pump properly equipped and operated in the mechanical laboratory of the University. There is much more of value in this paper than can be made clear by a cursory reference to it.

After adjournment of the morning session President Low received in the Library Building, and later, lunch was served in the Engineering Laboratories Building. The afternoon was passed in inspection of the various departments of the University. The Vauclain compound locomotive "Columbia," and the Allis experimental engine were favorite objects of attention.

On Thursday evening President Morgan and President-Elect Wellman received members and guests at Sherry's. Supper was served from 10 o'clock to 12, and there was dancing both before and after those hours. It was an altogether enjoyable affair and nicely carried through.

Friday.

The final session, on Friday morning, showed as strong attendance as any that preceded it. Prof. W. F. M. Goss' paper, "Tests of the Boiler of the Purdue Locomotive," held over from Thursday, was taken up first. An abstract of the paper was published in last week's issue of the *Railroad Gazette*. Several written communications were received, all of which bore a tone of full appreciation of the painstaking work represented by the paper, and confidence in the results as far as they had been obtained. Considerable attention was given to the use of the calorimeter and the point selected for its location on the boiler. There was evident a somewhat general belief that more nearly accurate results could be obtained in testing for moisture, by inserting the calorimeter pipe at a point in the steam pipe as near the cylinders as possible, rather than in the dome of the boiler. This line of discussion naturally led to some consideration of the value of superheated steam and a member expressed the hope that he should be able to present a paper on that subject at the next meeting of the Society. Mr. Kent expressed appreciation of Prof. Goss' paper and thought the test should be continued until brought up to the highest degree of availability for practical use, suggesting along this line of thought that a closer analysis of gases, a closer measurement of draft pressures and, if possible, a more accurate test of moisture in steam were desirable.

Mr. Rockwood, in the course of his remarks, suggested the use of mechanical draft, distinct from the exhaust, for use on locomotives, and, possibly, the placing of the cab far ahead and the use of the cylinder exhaust for heating feedwater; said, without much qualification, that most of the important improvements came from Europe and that we adapted them; cited, however, as illustration of our conservatism, some forms of valve gear that

have not been welcomed, and referred also to compound engines.

It seemed to be the general sentiment that mechanical draft of the kind mentioned had been tested and discarded long since in locomotive practice. Mr. R. H. Soule dropped a hot shot on the assertion that all good things came from Europe, by stating that he had quite recently received, as consulting engineer, a European design of a four-cylinder compound locomotive, with the option of standing sponsor for it and introducing it in this country; that after due consideration and consultation with others as thoroughly conversant with compound engine design, he had found that the design was absolutely impossible to apply to American practice and had therefore declined to take up the introduction of the engine.

In regard to Prof. Goss' paper as a whole and the criticism that it brought forth, Mr. Soule thought that the criticisms were largely those of what he termed professional critics, and in that sense valuable and to be desired; but that the main issues of the paper as presented stood as a most valuable contribution to the design of locomotives. He asked of Prof. Goss whether the curves appearing in diagrams with the paper could be applied directly to engine design or whether they should be taken guardedly and as approximates. Prof. Goss replied that the curves were thought to be reasonably correct and that by their extension to meet specific cases they could be used in engine design. It was thought that since the vibration of a locomotive running on a testing plant in some measure approaches that of an engine running on the road, minus the actual careening motion, the effect of vibration on evaporation would not be widely different on the plant from what it is on the road. The discussion abounds with interesting comment, including the consideration of flues and fire-box in their relation to evaporation. In conclusion Prof. Goss stated that the object of the paper was to study engine conditions rather than boiler conditions, and that the paper is really preliminary to another that he hopes may some time be forthcoming.

TESTS OF CENTRIFUGAL PUMPS.—W. B. GREGORY.

This paper has to do with tests of two centrifugal pumps, one being a small pump that is part of the equipment of the mechanical laboratory of Tulane University of Louisiana, and the other being a unit in the drainage system equipment of New Orleans and located at Jourdan avenue in that city. The latter pump has an impeller 70 in. in diam. with 26 in. width of blade at the widest part, decreasing to 10 in. width at periphery where there is a vortex chamber. There are double suction pipes 36 in. in diam. The discharge pipe is 48 in. in diam. near the pump, enlarging to 52 in. after passing the discharge valve. The pump shaft is horizontal and is direct-connected to a vertical triple expansion engine, the cylinders of which are 13 in., 21 in. and 34 in. diam., with stroke 24 in.

The paper is replete with diagrams and information in detail, comprehensive as the conditions of tests would permit. As usual in such matters, however, the data is so intimately associated with the diagrams that it is impossible to convey any concrete idea of the matter in abstract.

This paper, by Mr. Gregory, was the subject of severe criticism by Messrs. Adams, Jacobus and others. Mr. Wood rendered some of the seemingly questionable operations more justifiable, in his statement of the conditions under which the test was made. It developed from the remarks of Mr. Wood that no ready means of testing were at hand; that the Pitot tube was resorted to as a last recourse, in the absence of more accurate instruments; and that the low efficiency shown was partly to be accounted for in that, despite all efforts that were made to accommodate as large a volume as possible during the test, the large pump was at no time operating at anywhere near its full capacity, the lift being only a little over 2 ft. He admitted that the conditions practically made the observations of no material value. During the discussion of this subject Mr. William Kent pointed out an error in a commonly used formula, incidentally defining the difference between velocity due to head, and head due to velocity, as he expressed it. This factor in formulæ has been the subject of some contention and Mr. Kent's apparently final rendering of the matter will be of value as found in the *Proceedings* of the Society.

HARDNESS OR WORKABILITY OF METALS.—W. J. KEEP.

In the word "workability" the writer of this paper has tried to give expression to the work that may be imposed upon a tool by hardness and toughness in metal. A punch pressed into the surface of metal, is hindered by both of these properties. Reference is made to the experiments of Prof. Thomas Turner, and to a paper read by Prof. Thomas Egleston (*Transactions* of the Society, Vol. V, page 140) endeavoring to record automatically by diagram, or by weighted drill, the value of such resistance to tools. Mr. Charles A. Bauer, unaware of any former experiments along this line, arranged in 1897 an ordinary drill press for a test of hardness, using a flat drill ⅜ in. diam. under a pressure of 160 lbs., at a speed of 250 revolutions per minute. In the original Bauer machine a revolution counter recorded the number of revolutions of the drill required to penetrate a test bar to an exact pre-established depth and operated quite successfully. In fact the apparatus is said to have been in constant operation since 1897 with unvarying success. Mr. Keep perfected a machine having an autographic diagram for record instead of the count of revolutions. The paper considers the development of this machine and results obtained by it, with instructions for its use and diagrams and tables showing data of results. An account of work done with it for various societies and for individuals is given. The machine, it is said, has been found especially useful in taking borings for analyses and in establishing the character and consistency of foundry metals.

Mr. Keep's paper, which is here briefly extracted, brought written discussion from Messrs. West and Bacon, the sense of which was that the drilling test can result in no fair indication of the quality of pig iron.

A NEW PRINCIPLE IN GAS ENGINE DESIGN.—C. E. SARGENT.

This paper is a description and discussion of a new gas engine designed to get a more complete expansion of the gases during the working stroke. The idea involved is, instead of drawing in the fresh charge of gas through the whole stroke, to cut off the admission at some intermediate point, such as *e*, Fig. 1, and allow the charge to rarify during the remainder of that stroke. In this way, on the return, compression from atmospheric pressure begins at the point where the admission valve closed; the charge is then compressed and ignited, when a longer expansion follows. The exhaust then opens at the end of the stroke and on the return the products are driven out. The engine is governed as follows: If the full power of the engine is obtained, say, at one-half cut-off and it is so designed that the highest compression permissible takes place when giving its full rated power, then the governor is made to cut-off the admission and ignite earlier as the speed increases, avoiding loss by wire-drawing or late ignition. The following advantages are claimed for such a cycle:

"With a full load, a diagram shows from 20 to 25 per cent. more area than is usually obtained from modern gas engines; consequently, 20 to 25 per cent. more heat is turned into work for the same amount of fuel. A noiseless exhaust, doing away with mufflers, is possible. The average temperature of the cylinder is reduced several hundred degrees, avoiding the probability of premature ignition. The pressure on the exhaust valve is removed,

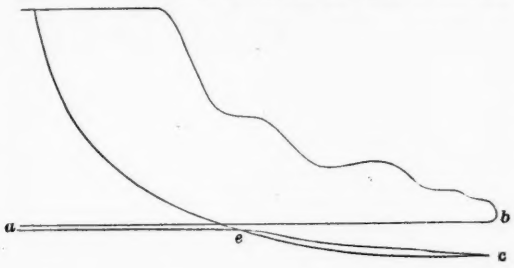


Fig. 1.—Indicator Diagram from Sargent Gas Engine.

taking a great strain from the side shaft, and on account of lowering the average temperature, makes possible the use of a piston rod, and a double-acting tandem engine; therefore, an impulse can be obtained at every stroke, as well as a compression for every impulse to absorb the inertia of the moving parts without transmitting any strain through the crank shaft. One crank pin may do four times the work of the crank pin in the ordinary gas engine. The desirability of using two tandem cylinders and getting an impulse at every stroke, has long been recognized, and tried with more or less success. With a temperature of 1,000 deg. Fahr. or more for the release, it is no wonder that hollow piston rods, with water running through them, must be used. The catalogue of one prominent manufacturer of gas engines says: 'Single-acting cylinders and trunk pistons are used, because they are absolutely necessary in a gas engine, for the reason that stuffing boxes and piston rods deteriorate too rapidly in such a temperature,' which would, no doubt, be true of the engine described in this catalogue, as the temperature of release is from 1,000 deg. to 1,200 deg. Fahr., maintaining, necessarily, a red-hot exhaust pipe. But, with the comparatively low temperature secured by more complete expansion, a piston rod running through water-jacketed stuffing boxes has worked satisfactorily. With a variable load, no loss by wire-drawing of the incoming charge is possible; the mean effective pressure drops much faster than the compression, and the highest pressure and temperature take place where the radiating surface is the least A regulation equal to the best steam engine is possible, and, with a practically uniform compression, smooth running is the result.

"While a more complete expansion of the gases is the essential feature of this paper, the adoption of such a cycle not only permits the construction of an engine having an impulse every stroke, but suggests a method of starting an internal combustion engine which has more than fulfilled our anticipations. Referring to Fig. 1, if the valve mechanism were so arranged that ignition took place at the point of admission closure or cut-off (*e*), and the exhaust would open at the end of the stroke and remain open during the back stroke of the piston, and repeat the same cycle each crank-shaft revolution, we would get an impulse every stroke, and with but one double-acting cylinder, would get two impulses every revolution of the crank-shaft. By the simple moving of a lever the engine may be changed from the ordinary four-cycle to this non-compression cycle, and Fig. 2 is a diagram taken from the engine after starting the same by turning the flywheel one-quarter of a revolution. The operation is as follows: The charge is drawn in by turning the engine by hand; as soon as the piston which starts at *a* reaches *e*, cut-off takes place, and ignition fires the charge, while the pressure goes up to *d* and expands to the end of the stroke *b*, where exhaust opens; the other end

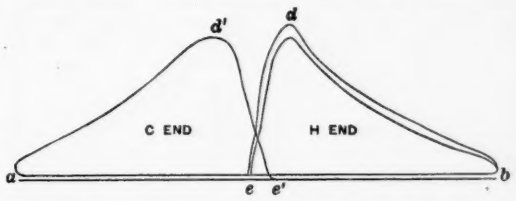


Fig. 2.—Starting Diagram from Sargent Gas Engine.

of the cylinder performing the same operation produces the diagram *be'd'ab*. As soon as the engine is up to speed, the ordinary cycle is thrown into operation. The cycle of this engine when starting will be recognized, by those familiar with the history of internal combustion engines, as that of the first successful gas engine invented by Lenoir.

"Such are some of the advantages of this engine, and though the details may have to be modified as long-continued operation will develop the defects, the author feels that the principles evolved are a great advance in internal combustion engine design, and that the method of accomplishing the results obtained will be of interest to the Society."

Mr. Sargent's paper, an illustrated extract of which accompanies these notes, brought out a limited discussion, some of which was written, along the lines which the topic naturally suggests. Nothing essentially new was brought out, except in the design itself, and results as stated. Many remarks favorable to the design were heard. The impression seemed to be that a decided step in advance had been made by Mr. Sargent, in the obtainment of greatly lowered temperature of exhaust, and that his claims, as set forth in the paper, were substantially correct.

HEAT EFFICIENCY OF A GAS ENGINE AS MODIFIED BY THE POINT OF IGNITION.—C. V. KERR.

This paper described tests with a Fairbanks-Morse four-cycle single-cylinder gas engine, cylinders 6¾ x 12 in., rated at seven brake horse-power. It was found that, for the particular engine tested, using 6.6 cu. ft. of air and 1 cu. ft. of natural gas, the highest heat efficiency under friction load and also under a brake load of 2.5 h.p. was given by igniting ½ in. before the end of the stroke, although the explosion pressure is greatest for still earlier ignition. When running under a brake load of 5 h.p. the greatest efficiency is found when igniting at the dead point and the highest explosion pressure when igniting 2½ in. before the end of the stroke. It is said that different results might be expected with different proportions of gas and air, or with a less positive sparking device.

Mr. Kerr's paper was read by abstract and received no discussion. It is given in brief with this note.

POWER AND LIGHT FOR THE MACHINE SHOP AND FOUNDRY.—FORREST R. JONES.

The writer has recently had occasion to investigate the plants of two concerns with regard to electric power transmission and light. In one of these, the floor space over which light and power are required is about 7 acres; in the other, about 4 acres. The arrangement of the floor space is radically different in the two cases. In the first, there are several buildings entirely separate and at some distance from each other, and the floor space is nearly all upon the first floor, there being a small amount upon the second floor, and next to nothing on the third floor. In the second, the floor space is nearly all in an L-shaped building, partly of four stories and partly of three, and, in addition to this, a small two-story structure setting close to the other building within the inner angle of the L.

Both plants were examined to see what requirements would have to be fulfilled by an electric system, for power transmission and lighting. In both cases the same conclusion was reached, namely, that the most feasible way to meet all requirements would be to adopt either one or more systems of electric circuits, the current to be of the same kind in each system if more than one were used, such that any electrical apparatus to be used in the plant, when placed in the location fixed for it, could be individually and conveniently attached to the electric circuit at a near point and operated by current therefrom in a manner suitable to the requirements of the service the apparatus was designed to perform. The selection of a single system from which all apparatus might be operated was based upon the conviction that, for machine shop and factory purposes, it is desirable to be able to interchange similar apparatus and to place any piece of apparatus anywhere upon the system, thus obtaining the maximum flexibility and greatest facility for operating portable machine tools at any point, and also to allow for alterations and extensions of the works.

The lathe was taken up first, and since in both establishments it was deemed advisable to have some lathes driven individually by variable speed motors, and that the variation of speed should cover, by small steps, a considerable range, the only thing that seemed satisfactory for this purpose in the present state of speed regulation for

different types of electric machinery, was the direct current. In order that the range of speed variation might be as great as possible, the multiple voltage system appeared to be advisable, even though the speed regulations were to be made, for a given supply circuit voltage, by rheostatic control of the current in the magnet coils of the motor. Other machines of a nature in a way similar to the lathe, so far as their driving is concerned, can be operated satisfactorily under conditions of speed variation similar to those which answer for the lathe.

The planer, whose reciprocating motion requires the reversal of nearly every part of its machinery, presents a problem which is not yet satisfactorily solved for electric driving by a direct-connected motor. The nearest solution that has been reached is to drive its countershaft in one direction continuously, and effect the reversals of the machine in the ordinary method common to mechanical driving.

Nearly all electric hoists and cranes are now operated by constant-pressure, direct-current motors. They seem to be at least as satisfactory as those driven by any other type of current. Constant-potential, direct-current arc lamps have long shown themselves efficient, durable, and otherwise satisfactory. They can be operated individually and economically at any pressure between 100 and 125 volts.

Motors for electric cranes and for general power purposes about the machine shop can be operated satisfactorily at any of the ordinary pressures for running motors, but it was not thought advisable, especially in connection with the conditions to be met in operating other apparatus, to give them a pressure greater than from 220 to 250 volts. The higher the voltage, within practical limits, the greater the economy of wire in the electrical circuit, of course. But, even leaving the requirements for other apparatus out of consideration, voltage as high as 500 is not desirable for the machine shop and foundry, for there is always considerable probability that employees will receive shocks by coming in contact with the wires or machinery. On the whole, it was, therefore, concluded that 220 volts for the majority of motors, and 110 volts for arc and incandescent lamps, would be the most suitable.

To obtain information as to power, tests were made upon individual machines, groups of machines, sections of line shafting, cranes and elevators. The data are of a nature not generally found in the reports that have been made upon electric driving, but present some rather unusual cases.

The power required to drive a couple of lathes, one of 48-in. and the other 36-in. swing, was taken when both were polishing hollow cylindrical columns, one 10 in. in diam. and the other 12 in. In both cases the polishing laps gripped the work so tightly as to keep the driving belt of each lathe on the point of slipping. The speed was as high as could be safely used for machines of this size. To drive the two lathes together under these conditions, something over seven mechanical horse-power delivered by the motor to the belt running from its pulley was required.

Although it is well known that the power required to drive a metal-working planer is generally greater on the return stroke than for the forward, or cutting stroke, and that, at the time of reversal, the power demanded is exceedingly greater than at any other time, the following data may not be out of place.

Two planers, one with 22-ft. table and 120 in. between housings, and the other with 25-ft. table and 72 in. between housings, were both driven by one motor belted to a jackshaft, which in turn drove the two countershafts of the planers.

120-in. Planer, with 22-ft. Table and 72-in. Planer with 25-ft. Table. Both Machines Driven by one Motor. Jackshaft Running in All Cases.

230 Volts.

Amperes.	
20	One countershaft.
60	Average for 120-in. planer on cutting stroke, light cut and one countershaft.
55	120-in. planer reversing from return to cutting stroke.
110	120-in. planer reversing from cutting to return stroke.
27	Both countershafts.
240 } 250 }	Both planers reversing from cutting to return stroke.

60-in. Planer with 24-ft. Table.

230 Volts.

Amperes.	
7	Shafting only.
8-9	Forward stroke without cut.
10-15	Light portion of cut on rough casting, 1/8-in. feed.
15-20	One tool cutting cast iron 5/16 in. deep x 1/8-in. feed.
20-25	One tool cutting cast iron 7/16 in. deep x 1/8-in. feed.
20-25	Cutting 1 1/16 in. groove in cast iron with square nose tool; feed between 1/32 in. and 3/64 in.; groove not cored.
35	Reversing from return to cutting stroke.
45	Reversing from cutting to return stroke.

74-in. Planer with 40-ft. Table.

Cutting speed, 20 feet per minute; two tools operating on cast iron; cut on each, 1/2-in. deep, 1/8-in. feed.

234 Volts.

Amperes.	
22	Countershafting only.
50	Considerable portion of the time while cutting.
60	For some moments while cutting.
35	Middle of return stroke.
90	Reversing from return to cutting stroke.
120	Reversing from cutting to return stroke.

Of the twenty-odd traveling cranes in one establishment, 10 were tested for the power required to drive them. Of these ten, some were driven electrically and some mechanically. The majority of the electrical cranes were of the ordinary types designed for electric driving. Obviously, in providing for the power to drive a crane it is necessary to know the maximum amount of power that it may demand for a period of time great enough to make the demand appreciably felt by the generating plant. In this respect the data, obtained from three electric traveling cranes of 30 tons capacity each, all traversing the same track above the foundry floor, show how great may be the demand, for an appreciable period of time, by some one of the cranes, and, with perfect possibility, by all of them at the same instant. Each of the 30-ton cranes was equipped with four motors 25 h.p. for bridge travel; 8 h.p. for trolley travel; 25 h.p. for the main hoist; and 16 h.p. for the auxiliary hoist.

30-Ton Electric Traveling Crane No. 1.

Pressure, 240 volts when crane was taking no current.

Amperes.	
125	Bridge starting, no load.
50	Bridge traveling uniformly, 350 feet per minute, no load.
33 to 40	Lowering, no load.
105	Starting to hoist, no load.
36	Hoisting uniformly, no load.
145	Bridge starting, 20-ton load.
50	Bridge moving uniformly, 240 feet per minute, 20-ton load.
95	Hoisting 20 tons uniformly at 10 feet per minute.
310 } 200 } 150 }	General maneuvering, 20-ton load.

30-Ton Electric Traveling Crane No. 2.

240 Volts.

Amperes.	
110	Bridge starting, no load.
65	Bridge traveling uniformly, 450 feet per minute, no load.
15	Trolley starting, no load.
13	Trolley moving uniformly, no load.
36 to 50	Lowering, no load.
130 to 150	General maneuvering, no load.
90	Bridge starting, 20-ton load.
50	Bridge traveling uniformly, 20-ton load.
145	Hoisting, rapid start, 20-ton load.
115	Starting to hoist, reading for 3 seconds, 20-ton load.
95	Hoisting 20 tons uniformly, at 10 feet per minute.
260	Bridge and trolley starting, reading for a few seconds, 20-ton load.

30-Ton Electric Traveling Crane No. 3.

240 Volts.

Amperes.	
90	Bridge starting, no load.
50	Bridge traveling uniformly, 535 feet per minute, no load.
38	Lowering uniformly, no load.
40 to 45	Hoisting uniformly, no load.
150	Bridge and trolley starting, 20-ton load.
30	Trolley at uniform speed, 20-ton load.
34	Hoisting uniformly at 11 feet per minute, 20-ton load.
240	Bridge and trolley maneuvering, reading for three seconds, 20-ton load.
320 } 250 } 200 } 230 } 180 }	General maneuvering, 20-ton load.

It can be seen, by examining the data obtained from these 30-ton cranes, that when all the motions on one were in operation simultaneously, and when two or more of the movements were started at about the same instant, the demand made for power during this general maneuvering was very great indeed. The readings given for such general maneuvering for two of the cranes when carrying a load of 20 tons each, the reading running as high as 320 amperes in one case and 310 in the other, represent demands for current during periods of from five to ten seconds' duration. It not unfrequently happens that such a condition comes about in everyday practice. That two or more of these cranes did, when in regular service, make very heavy demands for current at the same instant, was clearly shown by watching the ammeter at the switchboard of the generator supplying current to the three cranes only. Although this generator had sufficient capacity to operate several 30-ton cranes under what might be called average load, and the magnetic circuit breaker for the generator was set considerably above the steady-load capacity of the generator, it was not an unfrequent occurrence for the circuit breaker to open up the circuit on account of the great momentary demands made for power by the cranes. Tests upon a 15-ton electric crane, two 5-ton electric cranes, a 15-ton flying-rope crane, a 15-ton square-shaft crane, and a 15-ton square-shaft crane remodeled to be driven direct by an electric motor, all showed similar heavy momentary demands for current under general maneuvering.

Mr. Jones' paper, passages of which were read and commented on by the author, received no discussion. This paper contains some readily available data on the amount of power required to drive certain shop tools, singly or in groups, by the use of electric motors, and it was of such a character that it did not admit of ready discussion. It is nevertheless valuable and we publish, herewith, a liberal extract of it.

The final session closed with adoption of resolutions of thanks to Columbia University, to the Engineers' Club of New York, and to the Locomobile Company of America for courtesies extended, this action being followed by a brief address by retiring President Morgan. The convention adjourned at 1:05 p. m.

Proposed Illinois River Improvement.

A report has been made to Congress by Engineer Officers, covering the feasibility of connecting Lake Michigan and the Illinois River with 7 and 8-ft. channels; a little later reports on 10, 12 and 14-ft. channels will be submitted. The conclusion is that the best route for these depths is from Utica to Marseilles in the bed of the Illinois River, 11.4 miles; thence around the Marseilles Rapids by canal, 7.4 miles; thence in the bed of the river to near the mouth of the Kankakee River, 21.2 miles; thence by enlarging the Illinois and Michigan Canal to the Joliet basin, 18.3 miles; thence by canal through the Joliet basin and along the east bank of the Desplaines River, 4.5 miles, connecting with the Sanitary Canal at Lockport, and thence through the Sanitary Canal and Chicago River to Lake Michigan.

For the 8-ft. channel the dimensions proposed for the river sections and canal from Utica to the mouth of the Desplaines River are not less than 300 ft. wide at the bottom for the river divisions, and not less than 170 ft. surface width for canal, with depths in the river divisions 8 ft. below extreme low water and in the canal of 10 ft.

With locks of the same dimensions as the United States and state locks now in operation in the lower Illinois River, viz., 75 ft. wide x 350 ft. between miter sills, steamboat navigation will be extended to the head of the Illinois River. For the remaining canal divisions the width will not be less than 130 ft. at water surface, and the depth 10 ft., but the locks are reduced to 40 ft. width by 260 ft. between miter sills.

With fixed bridges giving 22 ft. head room, these dimensions should furnish ample navigation for the largest barges heretofore in use on the Mississippi River, and the combination will offer a waterway of 10 ft. depth at stages 2 ft. above extreme low water in the Illinois River, of sufficient capacity for any other large barge likely to seek it.

To overcome a mean difference of elevation of 133 ft. between the surface at Utica and the surface of the Sanitary Canal at Lockport, with allowance for variations in the stages at either end of the route, 12 locks have been provided for as follows: Utica river division, one; Marseilles, canal, three; canal to Joliet basin, four; canal, Joliet basin to Lockport, four. Two dams will be required, one at Utica and one at the head of the Marseilles Canal.

The Board is of the opinion that both dams should be surmounted by some form of movable weir to reduce the elevation of flood discharge by an amount at least equal to that which has been caused by the additional discharge from the Sanitary Canal. The 7-ft. waterway will follow the same route as that for 8 ft. The dimensions of river channels, canals and locks will be the same except in depth. This will furnish a 9-ft. navigation at a 2-ft. stage in the Illinois River to the mouth of the Desplaines River and a through barge navigation to Lake Michigan at Chicago. The estimated cost for the 7-ft. channel is $7,317,977, and for the 8-ft. channel $8,653,247.

Standard Draft Gear and Couplers.

We continue the publication of letters received on the matter of a standard draft gear and coupler. We regret that it is not practicable to give the names of the writers, but those which have been published are from superintendents of motive power up to presidents, and those which follow are from two vice-presidents in charge of operation and one vice-president and general manager; so this correspondence represents responsible opinion. Other articles will be found in our issues of Nov. 16, pp. 749, 756; Nov. 30, p. 794; Dec. 7, p. 804.

Something will have to be done in the near future to provide a draft apparatus that will meet the present condition of heavy engines and trains in which the cars are now being handled. There are two or three friction devices on the market, but none of them are being used to any extent, excepting that of the Westinghouse Company. We have a set of the Westinghouse which we procured recently for the purpose of applying them to a sample or experimental ore car. The dimensions, however, were so large that we were unable to apply the apparatus. The device as designed, increases the cost materially, $20.00 to $25.00 for this item alone, besides the additional weight which is three times that of the one now in use, and finally, the number of pieces used in this device is so large that it is a question whether one car repairer would be able to put it together after it had once come apart. Just to what extent the present friction buffer has passed the experimental stage, I am unable to state. A device so expensive and complicated in construction should be carefully considered before adopting the same for general use.

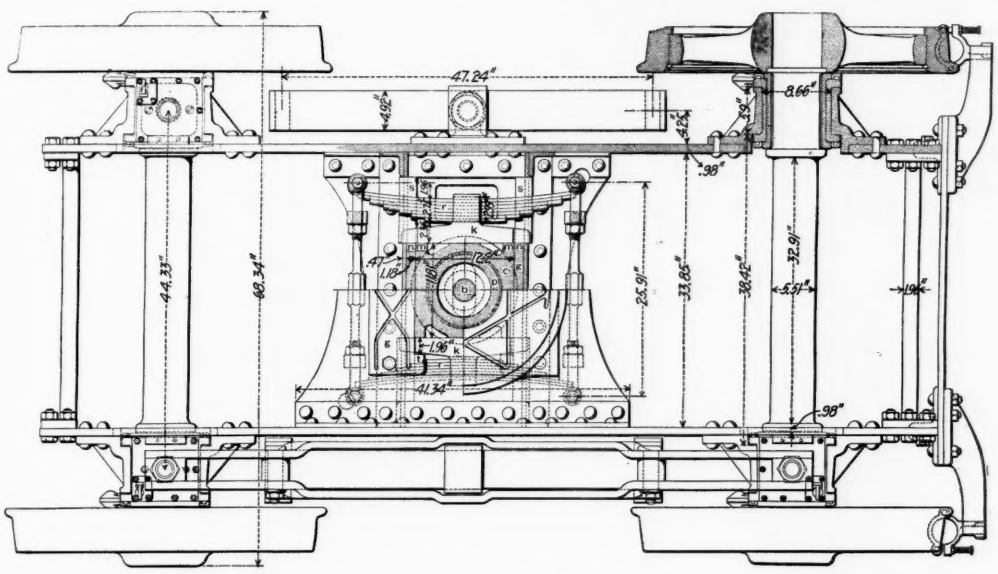
Mr. Westinghouse's proposition to select some standard coupler and draft gear for heavy service is extremely well-timed. We have been experiencing in common with other lines considerable trouble through breakages of couplers and have but recently insisted on heavier and stronger patterns which we have adopted for general use in the place of lighter ones that were causing us much expense and delay to rolling stock through inherent weakness. We have also been giving the question of improvement of draft gear some attention and have quite a number of the Dayton draft gears, to increase the capacity of our draft springs in use. The coupler question would certainly be very much simplified by the selection of a limited number and I understand the Master Car Builders' Association has the question in hand at the present time. We have often been struck by the very pertinent fact mentioned in your editorial that some five or six kinds would cover practically all of the M. C. B. couplers on freight equipment in the United States. We are carrying at the present time at repair points from 50 to 60 different kinds of knuckles for repairing cars received in interchange, and shall certainly lend our efforts to the eradication of the very large number of couplers that have a very limited use and little merit. The suggestion that whilst the roads are doing this, they should take up the

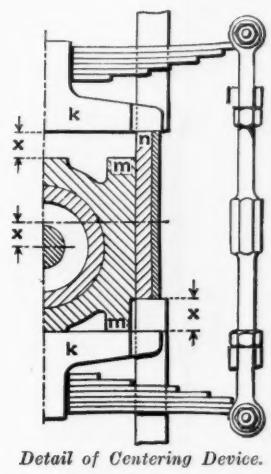
question of uniform draft gear is a good one and we shall be glad to co-operate in the associations and out, to bring about the reform suggested.

It certainly is up to the railroad companies to do something to prevent cars being broken to pieces by the use of so many air-brakes as we are using now, and on account of the very great increase in car and engine capacity. It is pretty evident that the usual draft attachments of the present day are altogether too weak for the great service required of them. Whether Mr. Westinghouse has got the best thing or not I am not prepared to say. There have been two or three systems of draft rigging on the market for some time which are very good, while Mr. Westinghouse's principle has only been put into practical operation a short time. There is no question but he has got a good principle, but whether he has got the right application time only can tell. There are other friction draft rigging appliances than his. Mr. Westinghouse not only has brought to bear great intelligence and long experience upon railroad appliances, but has attached to himself some exceedingly able men who are well posted in railroad lines and, therefore, it is fair to suppose that his study of the question is exhaustive. Eventually the kind of couplers to be used will resolve itself down into "the survival of the fittest," for even the poor railroads will find out that it is a source of gross extravagance to put in weak couplers.

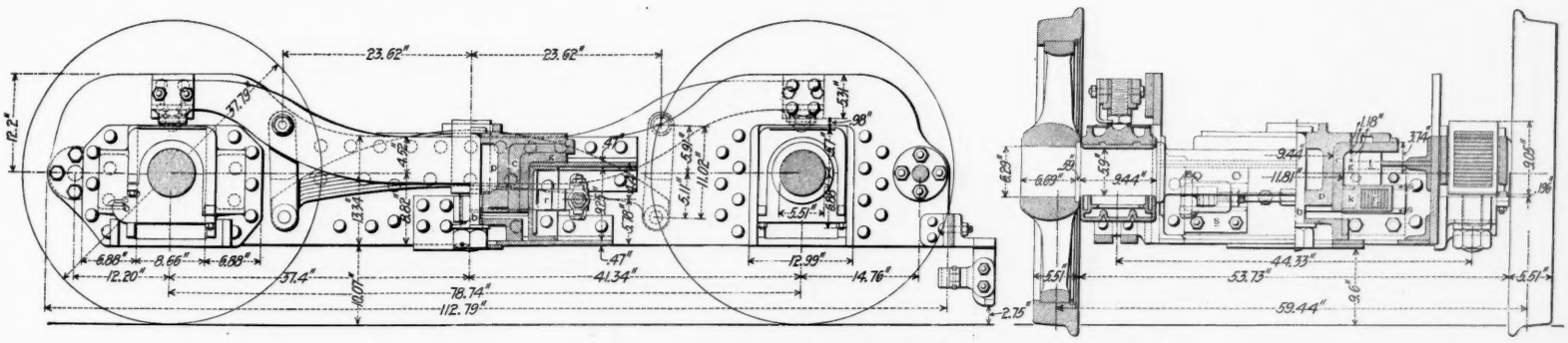
Engine Truck of the Western Railroad of France.

The accompanying illustrations show an interesting engine truck with shifting center, designed for fast express locomotives of the Western Railroad of France, by Mr. Clerault, Chief Engineer of Material and Traction. In 1889 an express locomotive equipped with this truck, the movement of which is described by its designer as pivotal and transverse combined, was exhibited, and it was the first of this type put in service on a French railroad. The same engine was on exhibition this year at the Vincennes annex of the Paris Exposition, after having run 310,685 miles. The same style truck has been applied to a great number of locomotives with but slight modification of the original design, the change being in the arrangement of the centering springs, to provide a greater lateral movement.





Detail of Centering Device.



Clerault's Engine Truck With Shifting Center—Western Railroad of France.

It may be seen from the illustrations that the truck frame is made of two side bars of steel 25 millimeters (about 1 in.) thick, connected at their ends by bars of round iron and by transom plates at the middle. Outside of the side frames, the frame is suspended from two elliptic springs, one at each side, placed longitudinally between the bearing points of an equalizer, the ends of which are carried directly on the axle boxes by means of adjusting screws. The weight of the engine is thus distributed between the two springs, which in turn transmit it to the axles, through the equalizers. This adjustment of the load, joined to the arrangement of the journals inside the wheels, is intended to assure to the truck the greatest possible steadiness. The axle boxes are of bronze with white metal lining and the cellars are of cast-iron, containing a lubricating brush. The pedestal jaws are of soft steel, riveted to the side frames.

The construction at the middle of the frame is arranged to take the rotating parts and the sliding parts, which are mounted as follows: The pivot, p, fixed to the frame of the engine, is a cylindrical piece of soft steel having a circular disk forming the support, on its upper face. This pivot engages in a spider, c, likewise of soft steel, which embraces it on the outside and in which it can turn freely. The exterior part of this spider slides on the two guides, g g, of soft steel, which have lugs, t, at their ends, limiting the lateral movement of the spider, the guides being fixed to the cross frames. A bolt, b, which goes through the pivot axially, prevents separation of the locomotive from the truck. It may be observed that the pivot is slightly back of the center of the truck frame. This is intended to ease the entrance into curves. Beneath the plane of the lugs, t t, are two rectangular openings in the transom plates provided with horn pieces, s s, serving as guides for elliptic springs. These openings, each set in the same relation to the pivot, receive the springs, r r, which control the lateral movement of the center casting. The spring bands are extended backward, k, and rest against the special carriers, m m, of the spider, n n, of the transom and guide casting. The springs are joined by rods and turnbuckles which unite the corresponding ends of each spring. With this arrangement when the pivot moves from its mean position, the two coupled springs are deflected an amount equal to one-half the displacement, x, one having its point of support in m on the spider, and the other in n on the cross frame of the truck. The initial tension of the elastic system is about 3,000 lbs. and its flexibility is .83 in. for 2,200 lbs.; that is, about .42 in. for the individual flexibility of each spring.

The Big Car Question in England.

At a recent meeting of the Institution of Mechanical Engineers a paper by Mr. J. D. Twinberrow was read on "Capacity of Railway Wagons as Affecting Cost of Transport." Sir William White was in the chair.

Mr. Twinberrow showed that in the mileage there was in 1889 an increase of 8.8 per cent. on the total for 1888, that capital had increased by 31.4 per cent., a portion of the increase, however, being due to nominal additions resulting from "splitting" of stock, and that 14.5 per cent. had been added to the amount available for dividend. The rate of increase of capital had thus been more than twice as rapid as the growth of the amount available for meeting interest charges. In the period referred to the contribution of passengers to receipts increased by 34 per cent., that from merchandise by 27.5 per cent., and that from minerals by 28 per cent. The passenger train mileage was 34.5 per cent. greater, so that the earnings per train-mile had slightly diminished. The tonnage handled in the cases of merchandise and minerals increased 36.9 and 40 per cent. respectively. The train-miles were 27.8 per cent. more, and, as there appeared to be no considerable reduction in the rates per ton-mile, the paying load per train-mile had remained stationary, but the average length of haul had decreased. The earning capacity of the trains was slightly less, while the cost of working was increasing, any improvements effected in locomotives, rolling-stock, and engineering practice not being sufficient to counteract the increasing cost of labor and materials. The principal factor in reducing the cost of a product was economy of labor in its manipulation.

The useful product of railway working was the passenger or ton-mile. These units determined the earnings, and therefore should form the basis for calculating the costs, but on British railways it was customary to refer the expenses to the arbitrary and unmechanical unit of the train-mile. This naturally tended to direct effort towards the reduction of costs per train-mile rather than towards developments of which the immediate effect might be an increased cost per train-mile, though the final ratio of earnings to costs was improved.

There were two ways of improving this ratio—first, by refining to the utmost possible extent the stock and plant employed to work trains of constant capacity and, secondly, by the efficient utilization of machinery and vehicles of greater earning capacity, thus permitting the realization of larger receipts per train-mile. The economies possible under the first heading were very limited, because refinement of design could only be expected to reduce the cost of fuel and repairs by a small amount, and would hardly affect the labor. If, the average gross trainload were doubled, by the efficient employment of engines of 100 per cent. greater hauling power the cost of fuel per train-mile would be increased to 5⅝d., and 50 per cent. might be added to the cost of repairs per mile run; yet as a final result it would be practicable to save upwards of 30 per cent. in the cost per ton-mile. But, apart from any change in motive power, the gross earnings per train-mile might be increased by employing vehicles of greater earning capacity, the saving in tare weight being replaced by an equivalent weight of paying freight.

On the railways of the United Kingdom the minerals constituted nearly three-fourths of the bulk, but yielded little more than three-eighths of the revenue, because the schedule rates for minerals were lower than those for general merchandise, while the average haul was probably shorter; yet the fact that the wagons were loaded to their full capacity, and could usually be dealt with in full trainloads, while there was no expense involved in collection and delivery at terminals, rendered this traffic fully as remunerative as that carried at higher schedule rates. Any saving effected in the tare weight of vehicles employed in this class of traffic would obviously permit of an equivalent addition to the paying load without increase in the cost of working. The average tare weight of a British mineral train being about 39 per cent. of the gross load, 61 out of every 100 tons of full trains were paying freight; if one-third of the dead weight were saved by the use of wagons of increased capacity, the tare would be reduced to 26 per cent. of the gross and the net load increased to 74 tons out of every 100. This was equivalent to an ad-

vance of over 21 per cent. in the gross receipts, or if the receipts remained constant the necessary train-mileage might be reduced 17.5 per cent. A train of standard 10-ton wagons would hald a paying load of 0.52 ton per running foot, about one-sixth of the total length being accounted for by the vacant spaces between adjacent headstocks; by increasing the capacity of the wagons a paying load of 0.84 ton per foot could readily be obtained, and thus the capacity per unit of length of train or siding increased by 62 per cent.

The conclusion that the short haul characteristic of much of the goods traffic in this country would prevent the realization of the economy secured on American railways by the introduction of rolling stock of high capacity was hardly warranted by a consideration of the influence of the decreased mileage per ton upon working expenses. The short haul enhanced the relative importance of terminal charges and increased the ordinary expenses per train-mile because it decreased the daily mileage obtainable from engines and wagons. It therefore tended to emphasize the necessity for increasing the gross receipts per train-mile, while the multiplicity of junctions and sidings gave additional importance to the compact formation of trains of high capacity rolling stock. The Great Western Railway had built some bogie wagons, each capable of loading 40 tons, the tare weight being 17 tons 7 cwt. It was possible to construct a wagon having a body of twice the standard capacity with an increase of one-third only in the tare weight. Both the Great Western and the London & North Western Railways were experimenting with steel coal wagons of 20 tons capacity; the tare weight of the Great Western wagon was 8 tons 6 cwt., while that of the North Western's was 7 tons 18 cwt. The author, in conclusion, pointed out that their successful introduction depended on a satisfactory solution of the question of terminals.

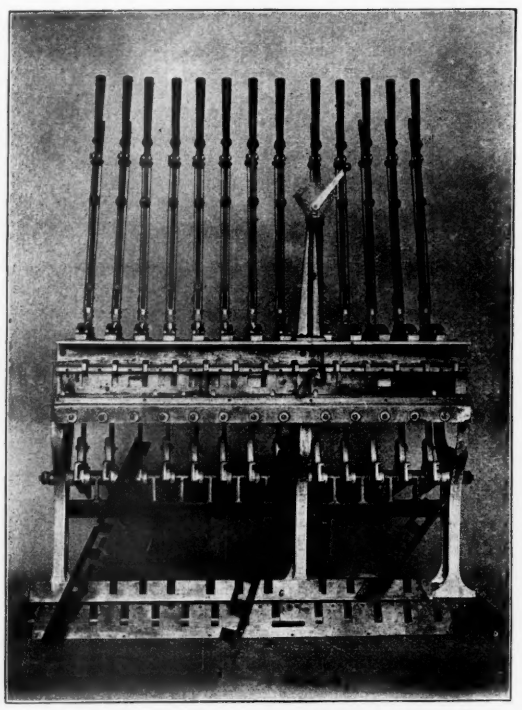
Mr. J. A. F. Aspinall (General Manager of the Lancashire & Yorkshire Railway) said an important element in the question was the private ownership of wagons, about 500,000 being in the hands of private owners. Hence any proposal for altering them touched a very large number of people. It was unfortunate that this private ownership ever took root in this country. It could not be a good thing that half a million wagons should be moved empty during at least one journey, as these were, and any change that led to the use of these empty wagons would be an economy. It was not only the haulage of them that told; marshaling, sorting, etc., represented a tremendous annual loss. As to the long wagons advocated by Mr. Twinberrow, the collieries on the one hand and the dock companies on the other controlled the situation, the railways being only intermediaries; he himself would only be too glad if they could be persuaded to alter their arrangements.

In reply Mr. Twinberrow fully admitted the difficulties in the way of introducing wagons such as he advocated, but they were not insuperable. He did not think the matter of existing plant would long be allowed to stand in the way, and he could not understand the argument that plant was not to be altered because it had been on English railways from their beginnings. As to the continuous brake, some people seemed to look on its adoption for goods trains as a luxury, but he believed that its cost would be paid for over and over again by the facilities it would introduce in working.

The French Northern Railroad seems bent on making Paris a suburb of London. The time of the fastest train from Paris to Calais has been 3 hours and 35 minutes, and that only recently. Lately a trial was made with a train which ran the 300 kilometers in 3 hours, but was 10 minutes longer in going back to Paris. It is claimed that a speed of 87 miles an hour was reached on certain stretches between stations.

The Rowell-Potter Interlocking Machine.

The Rowell-Potter Safety Stop Company, of Chicago, is putting on the market a new manual interlocking machine which is very compact, and in which no dogs or tappets are used, the locking being directly on the links. Referring to the engraving, it will be seen that each link has an extension at the forward end. The locking is accomplished by passing a bar under this extension when the lever is normal, and over it when it is reversed. The



The Rowell-Potter Manual Interlocking Machine.

Front View—Combination Bar and some of the Locking Bars removed.

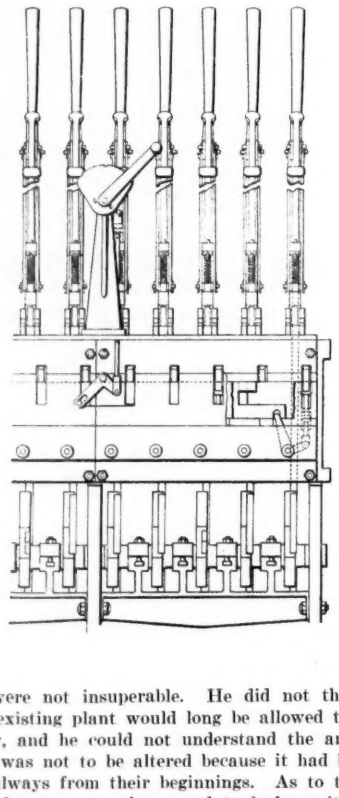
locking bars are of steel and are contained in a slot in the front of the frame, 3 in. wide x 4 in. deep, regardless of the number of levers. Each bar is moved by a short direct connection to the link and there is not the necessity for the close adjustment needed with the dog and tappet movement; there is also less chance for wear. One of these machines has been installed at Glassboro, Ill., at the crossing of the Illinois Terminal R. R. with the Cleveland, Cincinnati, Chicago & St. Louis and the Chicago & Alton; and another interlocking is about completed at the junction of the Chicago, Burlington & Quincy and Peoria & Pekin Terminal roads at Peoria, Ill.

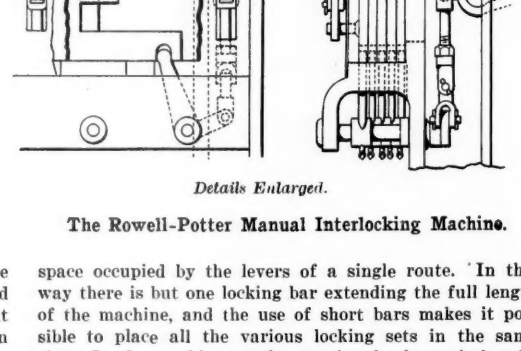
The locking is simplified in these machines by the use of a combination locking bar, extending the full length of the machine, which serves as a route selector. When this bar is in position to free all the levers of one route, it locks the levers of all opposing routes, depending upon the arrangement of the slots in the combination locking bar. The levers of the route freed by the selector may then be pulled in the order of their individual locking combination. The individual locking bars for the set of levers controlling each route are separate from and independent of the individual locking bars of all other levers, so these individual bars are made no longer than the space occupied by the levers of a single route. In this way there is but one locking bar extending the full length of the machine, and the use of short bars makes it possible to place all the various locking sets in the same slot. In the machines so far put in, the frame is but 28 in. wide and no additional space, either vertical or horizontal, is required for the locking. This is the arrangement for simple locking, but it is evident that special locking can be done and that this machine has considerable flexibility in this regard.

The link is suspended from the frame and when in the normal position the lever cannot be unlatched without lowering slightly the forward end of the link. If there is a locking bar under the link extension, the lever cannot be unlatched and an attempt to move the lever when locked, puts no strain on the locking. In reversing a lever, the next lever of the combination is not unlocked until the first lever is thrown and latched. Latching the lever completes the movement of the locking bar.

It will be seen that the link extension of each lever is connected to one arm of a small crank shaft mounted on the frame. The other arm of this shaft engages a slot in the bottom of the locking bar, so that any movement of the link causes a corresponding movement of the bar.

Plans are now being made in which the construction will be further simplified by doing away with these connections between the link and locking bars; then the locking bars will be shifted directly by the link extension working in suitable slots. The frames are cast, but all the working parts of the machine are drop forgings.





Details Enlarged.

The Rowell-Potter Manual Interlocking Machine.

The British Westinghouse Electric and Manufacturing Company.

The first annual general meeting of the shareholders of the British Westinghouse Electric & Manufacturing Company was held Nov. 23 in London. The Chairman of the Executive Committee, Mr. Parsons, presided. He said that they had hoped that Mr. Westinghouse would be present, but he was greatly occupied in America going over the plans and specifications for the equipment of the Manchester factory.

The sales of the company during the financial year amount to about $2,750,000, which is more than double the sales in the preceding year. Important contracts are pending. The company is handicapped in that it is trading with machinery procured from the American company, and when the Manchester works are done it will undoubtedly be able to do a larger and more profitable business. The manufacturing company will employ at Manchester from 3,000 to 5,000 men, and the company is gradually getting together the staff to manage this concern. The American company guarantees the interest on the preference shares for the British company for two years. Building at Manchester has been delayed and the works will not be completed in the time anticipated, but there is good reason to believe that the American concern will continue the guarantee until these works are in operation.

Reports have been circulated that the company has abandoned the construction of the Manchester works. This is not true; on the contrary, operations are proceeding and young engineers have been sent to Pittsburgh for training. The shops which are building are intended to turn out electrical machinery and steam engines and gas engines of large size. There will be not only a steam plant but a gas plant for running gas engines, and the company will be in a position to ascertain in its own work the relative advantages of large gas engines and steam engines.

Mr. Parsons spoke particularly of the matter of electrifying the London Underground (Metropolitan and Metropolitan District Lines). This company presents a proposal to supply the entire outfit of electrical machinery and rolling stock as well. Bonds in payment will be issued to the contracting parties on the certificate of the engineers of the railroads, and these bonds may be negotiated by the Westinghouse Company as they think fit. This method of financing the contract requires parliamentary action, as does the proposal to lease sites for the generating stations.

The Chairman, in answer to questions, explained more particularly about the delay in building. In the first place the company had been most anxious to place the order for the steel work in England instead of in America. They asked bids from British and American contractors and found that there was a difference of four or five months in favor of the Americans. They thought, on the whole, however, that it was best that the contract should be placed in England, and it was placed with Messrs. Dorman, Long & Co., of Middlesborough. The steel contractors have delivered a good deal of the material, which

is now being erected rapidly, and four other contractors are helping them out. There will be about 12,000 tons of steel. Possibly by the end of next year the company will be able to commence work, but it will not be much before that time. It is useless to begin on a small scale. If the company gets the Metropolitan contract the machinery will have to be manufactured in America.

Strike of Atchison Telegraph Operators.

The telegraph operators on the lines of the Gulf, Colorado & Santa Fe struck on Dec. 6 and left their work. The grievance, it is said, had to do with the hours of employment and other regulations, and not with the rate of wages. On the 8th Mr. Dolphin, President of the operators' brotherhood, ordered the operators on all of the lines of the Atchison to leave their work, although on the Northern and Western lines an agreement between the company and the brotherhood had been entered into less than a month before. This agreement was the result of the negotiations between the company and its operators, which followed a very brief strike on Nov. 13.

On July 1 last, a set of rules and regulations governing the employment of operators was adopted and put in effect on the company's lines east of Albuquerque as the result of conferences between the railroad officers and the chiefs of the Order of Railway Telegraphers. On Nov. 6 a committee representing the operators west of that point asked for changes in wages as well as in the rules and regulations. After several conferences and a 30-minute strike the road agreed to an increase in wages on the Santa Fe Pacific and other lines west of Albuquerque, and the rules and regulations then in force east of that point were made to apply to the lines west. There then remained the Gulf, Colorado & Santa Fe. The proposition of the railroad was to apply the same rules and regulations governing the employment of operators which had been agreed to as fair on the other lines; and that where agreement could not be reached on questions of pay, they should be submitted to arbitration. But the road, while willing to arbitrate on wages, declined to arbitrate on the rules and regulations, with the result that a strike was ordered.

The strike in Texas and the strike on the other lines which followed it appear to have been quite general. On some divisions nearly all of the operators left their work. The newspaper reports contain the usual contradictory statements, the officers of the road saying that the interruption of trains is not very serious, and the operators claiming that they are having great success. At this writing, however (Wednesday), the passenger traffic of the road seems to be in nearly or quite its normal condition, and there are but very few reports of delays to freight. Press despatches showing the condition of things to be normal are numerous, while all those showing that the strike is serious are given as coming from the leaders of the strike. Except in Texas, a considerable percentage of the operators remained at their posts, and at the worst the company appears to have secured operators to fill its most important stations within one day.

Only about 75 per cent. of the operators on the road belong to the brotherhood, and of these, taking the system as a whole, less than half stopped work. It is announced that none of the strikers will be taken back.

The block system had to be suspended, apparently throughout all of the lines where it was in use. On the line from Chicago, Ill., to Newton, Kan., it was resumed on the 11th. On that day the officers of the road announced that a large share of the strikers' places had been filled with new men, and that they had engaged all the operators needed. President Ripley also said: "Freight moving everywhere without delay; no accumulation at any divisional terminal. All passenger trains are moving with regularity." None of the press despatches, from any point, so far as we could discover, contained any statement of fact essentially contradictory to this; so we must conclude that the strike was a complete failure.

On the first day of the strike when there was a possibility of serious suspension of traffic, General Manager Mudge announced that if trains could not be kept running the shops at Topeka would be shut down to save expense.

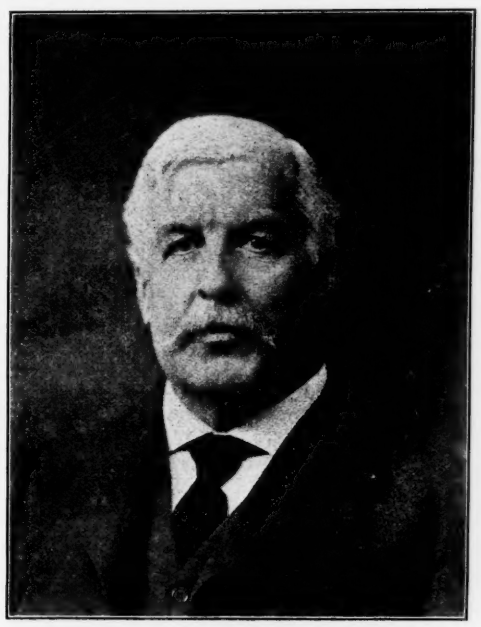
Mr. J. M. Barr, Third Vice-President of the Atchison, on Dec. 5 issued a circular giving the correspondence which had passed between himself and the officers of the brotherhood since last June. While it is impossible at this distance to form an opinion of the merits of the controversy, from the facts given in the circular, the impression conveyed by the various letters and telegrams is that the railroad company was not only fair but generous. Indeed, if we may judge by the very poor judgment manifested by the officers of this brotherhood in the past, and in the present negotiations, Mr. Barr and Mr. Polk (Manager of the Texas lines) were both pretty lenient. They appear to have consented to arbitration of questions between the company and the operators far too soon. Some quite conservative railroad managers will say that they ought to have made a stronger fight.

It is believed in some quarters that the ultimate object which the order is working for is to have the operators on the Santa Fe all made station agents, as is the case on one other Western road.

H. J. Hayden.

Mr. Horace J. Hayden, Second Vice-President of the New York Central & Hudson River, was instantly killed on the evening of December 7, by falling out of a fourth story window of his house, 337 West Seventy-sixth street, New York City. Mr. Hayden had been under medical care several months for heart disease, and he had suffered from nervous prostration and dizziness; and it is supposed that he felt faint, opened a window for fresh air, and lost his balance. Mr. Hayden was born in Boston, September 11, 1840, and was graduated at Harvard in 1859. At the opening of the Civil War he entered the regular army, and rose to be a Major in the Fourth Artillery. His first railroad service was as a clerk in the office of the General Superintendent of the Chicago, Burlington & Quincy. This was in 1868. In 1873, he became General Freight and Ticket Agent of the Missouri River, Fort Scott & Gulf, with headquarters at Kansas City; but in the same year he went to Boston as General Freight Agent of the Boston & Albany. From there he was called to the New York Central, in 1880, on the death of Mr. Rutter. He was made Second Vice-President in 1885.

On the formation of the Joint Traffic Association, in January, 1896, Mr. Hayden was appointed as the representative, in the Board of Managers of that Association, for all of the Vanderbilt lines; and he was the Chairman of the Board of Managers throughout the existence of the Association. From the time that he took this position his relation to the traffic department of his own road became mostly advisory, and for the last year or two his duties have been very light. When the New York Central, in April of this year, secured an interest in the Chesapeake & Ohio, Mr. Hayden was made a director in that company. He has long been a director in a dozen



Horace J. Hayden.

or more of the subsidiary railroad companies controlled by the New York Central.

Mr. Hayden began his railroad career somewhat late; and his training in the traffic department did not begin until after he was 30 years old; but his reputation was as high as that of any man in the traffic field. He has been spoken of as second only to Albert Fink, as a master of that part of "the railroad problem," which has to do with regulating rates between competitive points; but the two men were so different that there is not much ground for comparing them. Mr. Hayden's most notable peculiarity was, perhaps, his ability to remain imperturbable under the most annoying circumstances; and circumstances of that kind have to be the meat and drink of the traffic manager for months at a time. This, with his complete mastery of the details of his work and of the myriads of facts affecting the interests of his road, must be set down as the main element of his success. Personality, combined with accurate knowledge of his own road's interests at every turn of the kaleidoscope is, indeed, the main thing in every traffic man's business ability; but that would not be a correct statement of the reason why Mr. Hayden was a good traffic manager. Personality cannot be described in a paragraph. It can only be conveyed by giving at length many incidents of a man's life, and the limits of space prevent that here. Many traffic men have achieved success by the influence of a personality very different from Mr. Hayden's. One is an expert in calculating values; another in guessing at what his competitor's next move will be (a most important talent); another at surveying a wide field and maintaining harmony among a large body of agents. Mr. Hayden was perhaps best in the last named. His selection for the trying position of representative of the New York Central in the Joint Traffic Association was a high testimonial to his ability and character, and his prompt selection by his eight associates as their chairman was a higher one. He acquitted himself in that position with great credit. The Association was a failure because it was at best an effort, repeated day after day, to erect structures which everybody knew were quite likely to soon crumble. The Association had constantly to employ the methods of the builder in stone, while all the time the material and the structures had, or soon developed, the qualities of quicksand. The Association being a failure, those who managed it have no monuments; but the work done by the men who tried to make the best possible use of that instrumentality for honestly conserving railroad property was of the highest quality and deserves precisely the same reward as it would have received if it had accomplished the hoped-for results; and Mr. Hayden's part was that of a leader.

Personally, Mr. Hayden was genial, really kind, of cultivated taste and wide reading, and he always impressed one as a man of sincerity and rectitude; his standards of life and conduct were high.

Foreign Railroad Notes.

The victims of the railroad accident near Offenbach, in Germany, Nov. 8 (reported Nov. 30, p. 799), were 12 in number, instead of 9 as first reported—all burned. The remains were gathered and buried at Offenbach with imposing funeral solemnities, attended by thousands of people, and conducted by the public authorities. Two of the victims were Russians, and a Russian priest, a Catholic priest, a Jewish rabbi, and a Protestant clergyman took part in the services. Each of the 10 coffins was carried by six railroad employees in uniform. The President of the railroad directory (Prussian State), on whose line the accident occurred, was present with nearly his whole staff of officers, with a number of civil and military officials, and at the grave the President, in the name of the directory, placed a wreath on each coffin and made a short address expressing the sorrow and sympathy of the railroad authorities and their conviction that the accident was due to no negligence on the part of employees, high or low. He also placed a wreath on the grave in the name of the Minister of Public Works, the head of the railroad system.

At a Congress of Manufacturers in Austria last October the recent increase of freight rates on the State Railroads was condemned; complaint was made that the matter was not submitted to the National Railroad Council, for its opinion—a body established purposely to give voice to the desires and opinions of shippers. Then after complaining of what the State Railroads had done, the Congress said that it was convinced that no improvement in traffic matters could be effected until all the principal railroads had become State Railroads.

The Swiss are discussing the plan of administration of the future State Railroad Systems. The Council of the Confederation has provided for five departments—finance, traffic, operation, construction and law. The operating department would have charge of all rolling stock and shops, and would seem to have more to do than all the rest put together. It has been suggested that rolling stock is enough for a department by itself, and that at all events one head of department should be a mechanical engineer.

Most street railroads on the Continent of Europe are divided into sections; you pay one fare if you ride over one section only (a mile or so), more if you ride over two, etc. This has been the case in Berlin until Oct. 1, when a uniform 10 pfennig (2.4 cents) rate was made for all distances on most of the lines of the chief company. The result in October was an increase of more than 10 per cent. in receipts compared with last year.

The Russian standard freight car has a capacity of 750 poods, or 27,000 lbs.; but a few years ago the standard was 610 poods. The Minister of Transportation is now said to contemplate offering a reward for the best design for a standard car to carry 54,000 lbs. With the great distances freight has to be carried in Russia it would perhaps have more to gain by large cars than any other European country.

The Prussian State Railroads boast of their greatest achievement in freight traffic on the 16th of November last, when, in the Ruhr coal district—a very limited area—no less than 23,981 cars were dispatched; most of them being switched to shippers, and made up into about 480 trains. Of the whole number 18,063 were coal cars.

There is to be a new "limited train" from North Europe to Nice, starting from Hamburg, passing by Hanover, Frankfort and Strasburg, entering France at Belfort, and going thence to Lyons and Marseilles, like the trains from Paris. Connecting trains bring it passengers from Amsterdam, Bremen and Berlin. The time from Hamburg to Nice is about 31 hours.

The Spanish Minister of Public Works has ordered the Government railroad inspectors to impose a fine of $250 on railroad companies when they do not furnish shippers with cars enough.

The Hungarian State Railroads have ordered this fall 52 locomotives and 40 snow plows.

In the month of October the Simplon Tunnel got ahead 984 ft., making 22,249 ft. in all.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

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It is becoming apparent that wheels under heavy cars are not giving the service which is obtained from similar wheels under lighter cars. It is not clear whether the present difficulty is to be charged to the greater load imposed or is to be looked upon as the result of a more severe action of the brake-shoe, for the work of the latter necessarily increases in proportion with the load on the wheel. Breakages have generally occurred by portions of the flange shelling off, indicating weakness in the wheel at this point. But wheels cannot be made thicker at the base of the flange without exceeding the limits set by the M. C. B. Association for the protection of frogs and switches. So serious does the matter appear to motive power officers that some of them predict that the ultimate success of the 100,000-lb. car must depend upon the use of steel wheels, and it is pointed out that under such an alternative, the general adoption of the large car will fail. It is probable, however, that such statements represent an over-cautious view, and that wheel makers will be able to meet present requirements as they have succeeded in meeting those of the past. The actual number of these failures under heavy cars has not been large, and doubtless care in the selection of wheels and perhaps a more frequent inspection of them while in service will allow cast-iron wheels to be used under 100,000-lb. cars with the same security that now attends their use under cars of 60,000 lbs. capacity.

The Isthmian Canal.

Since we wrote last week on this subject we have received the full text of the preliminary report of the Commission which gives a good deal of information not contained in the newspaper abstracts, some of which we shall use in a later issue. Our purpose now is to speak of the reasons which controlled the Commission in recommending the Nicaragua route rather that the Panama route. As we have repeatedly said, the report of this Commission ought to be taken as authoritative and final, and in this way we accept it.

It will be remembered that the Commission finds that to complete the Panama canal it would cost $58,000,000 less than to build the Nicaragua canal, also that the Commission does not know what it would cost the United States government to buy a controlling interest in the stock of the New Panama Canal Company; also that the Commission thinks there is reason to believe that the price that the United States would have to pay would be sufficient to make the total cost not less than the Nicaragua canal.

Having disposed of the question of cost it remains to balance the engineering considerations, and here the Commission in its preliminary report does not express a definite opinion. Reading the report we should gather that on the whole the Panama route is preferable, considered, merely from the engineering standpoint. It is shorter, straighter and has natural harbors, and a much lower summit. On either route there are to be built engineering works of the first magnitude and, perhaps, on the whole, the Nicaragua route is the more difficult in this particular. Obviously the cost of operation and maintenance of the Nicaragua Canal must be much greater than that of the Panama Canal. Some of these advantages are offset by the shorter sailing distances by way of Nicaragua. Trade going from New York, Liverpool and New Orleans to San Francisco and Yokohama will save distance by way of Nicaragua, this saving varying all the way from 579 miles down to 255 miles. On the other hand, the trade between our eastern ports and the west coast of South America would save in distance by way of Panama, the greatest saving being 383 miles and the least (from New Orleans) 181 miles. So far as we can make out, the advantages of the two routes are nearly enough balanced to justify reasonable difference of opinion as to which should be chosen.

But we have before intimated that the terms of the Panama concession and the political situation would probably be found such as to turn the judgment against the Panama, and this we find to be the case.

The concession is to continue for 99 years from the day when the canal shall be opened for public service, and that day is fixed in the contract as Oct. 31, 1910. By the sole fact of the expiration of the concession, the government of Colombia becomes the absolute owner of the canal and all its fixtures at the end of 99 years. There is no provision for an extension; and this is true of the Panama Railroad property, owned by the canal company. The United States therefore, under the concession, could not have control and ownership in perpetuity. Furthermore, the canal company is prohibited to cede its rights under any consideration to any nation or foreign government under penalty of forfeiture. The concession carries heavy money obligations. For 25 years the canal company must pay to the Colombian Government 5 per cent. of its gross income from all sources without any deductions whatever. This gradually rises to 8 per cent. of the gross income, and the company guarantees that in no case shall it be less than $250,000 a year. Furthermore, the railroad company must pay an annual sum of $250,000 in American gold. It was discovered also that under the charter rights of the new Panama Company, all plant necessary for building the canal shall be manufactured in France, and the material must all be of French origin.

It is apparent that the privileges of the Panama Company could only be bought by the United States encumbered with conditions not contemplated by Congress. It is apparent also that if the United States could make a reasonable bargain with the canal company it would still have to bargain with the Colombian Government for such rights of control and ownership as Congress demands, and the Colombian Government is an element of extreme instability. Back of all this is the fact that the Panama Canal Company has not offered to dispose of its properties and privileges, nor has it expressed any wish to enter into negotiations with the United States for such disposition of its property.

There are still other legal obligations in the matter, but these seem only to justify the conclusion of the Commissioners. The fact is much to be regretted, for it would apparently be to the advantage of the United States and the world in general for the choice of routes to be settled purely on engineering and commercial considerations.

The Work Done by a Railroad Hand.

What is the efficiency of the railroad as a means of transportation? If we mean by that the amount of transportation which it enables a man to effect, we shall find the answer to this question by dividing the amount of transportation (the number of passenger-miles and ton-miles), by the number of men employed on the railroads. Making this computation for the railroads of the United States in the year ending with June 1899 we find that 928,924 employees moved 14,591 millions of passengers and 123,667 millions of tons of freight one mile, which shows an average performance per man of 15,708 passenger-miles and 133,130 ton-miles.

We will do well to consider these figures a little. Nothing shows so plainly the efficiency of the railroad as a labor-saving device. Through it one man has been made able to do an amount of work in a year equivalent to the moving of 16 passengers and 138 tons of freight from New York to Chicago; or, to limit the distance to what one man could drive a wagon over, to 175 passengers and 1,479 tons of freight from New York to Philadelphia.

In this country, the average efficiency of the railroad employee has increased greatly of late years. The amount of travel per employee has often been greater than last year, and in 1894 (World's Fair travel) was 18,320 passenger-miles, and it has not in other years varied very greatly; but the number of ton-miles per employee has increased 30,000 (29 per cent.) since 1894, and 15 per cent. in the last two years.

The railroad army was greatly depleted after the crisis of 1893 by discharges and indefinite furloughs, and numbered 94,000 less June 30, 1894, than one year before. But the decrease in the force was less than the decrease in the freight traffic. This force had grown very rapidly (124,300, or one-sixth) from 1890 to 1893. In successive years since, the numbers of railroad employees have been:

1894.	1895.	1896.	1897.	1898.	1899.
779,608	785,034	826,620	823,476	874,558	928,924

In the last year, just about one-eightieth of the population was employed on the steam railroads; in 1890, 1 in 83½—a slightly larger proportion now than then. But meanwhile, though the amount of travel per inhabitant is practically unchanged, the amount of freight traffic has increased from 1,217 to about 1,671 ton-miles.

The Cullom Bill Again.

The doings of the "Interstate Commerce Law Convention" at St. Louis, Nov. 20, have reached the public in three installments. We noticed last week, page 810, the fact that the Merchants' Association of New York made an intelligent protest against the sweeping nature of the amendments to the Interstate Commerce Law, which are proposed by the leaders of the St. Louis movement. This protest came to us by mail some days after the newspaper report of the convention had been published. We now have another protest, in the shape of an interview with Mr. E. C. Simmons, the hardware merchant of St. Louis, in a St. Louis paper, which, it appears, we failed to see, in our reading of the newspapers of that day. Mr. Simmons' interview now appears in the shape of a reprint from the *Northwestern Miller*, of Minneapolis; and the *Northwestern Miller* itself appears to be decidedly out of sympathy with the millers who got up the St. Louis meeting. Mr. Simmons said, in part:

"I had thought that it was a conference of merchants and business men to discuss the proposed bill, but when I got there I found a meeting to memorialize Congress for the enactment of the bill, not for discussion; and feeling as I do about the bill, that meeting was no place for me. Our firm is the largest shipper in our line in the world, and every year we pay the railroads immense sums in freights, yet I am interested in no railroads and do not even ride on a free pass. Nor would I do it. I object to the proposed bill because its rate-making clause, providing that rates for all the railroads in this country should be made by seven men, gives that set of men too much power to be safely entrusted to any set of men. I object because I think the proposed law a step in the direction of socialism and municipal ownership, and I certainly oppose government ownership, because I believe it would build up a political machine, the like of which the world has never seen, and would perpetuate one party in power forever.

"I am opposed to the bill because I think it unfair and impracticable. The transportation interests of this country, with their diversified ramifications, are too extensive for any set of seven men to make and maintain rates. They would have to entrust the work to deputies, and thousands of these would be needed for it. The men now engaged in rate making would probably be employed, and where so many men are employed is it not reasonable to suppose that some dishonest bribe-takers might slip in? With the interests of the country and the interests of the railroads so ramified and extensive, there is bound to be some discrimination in the matter of rates, for what is a discrimination against one point is bound to be in favor of that point's competitor; and I do not believe the angel Gabriel could come back to earth and make favorable railroad rates without discrimination. If the seven commissioners contemplated in the bill make freight rates through their agents, do you not see what a great political machine may spring up? . . .

"I have made a study of freight rates and of interstate commerce, and in that bill I do not think there is one clause to recommend it. It is an unwise bill. The great shippers of the country have not yet spoken on the bill. . . . We will be heard from in the Senate when the bill comes up for its passage."

The *Northwestern Miller*, in its report of the St. Louis meeting, says that there were only 39 persons present, of whom 11 were millers. When Mr. Simmons gave his views it was intimated to him that any one not in sympathy with the Cullom bill might withdraw from the convention; and Mr. F. B. Thurber, of New York, who suggested that before sending a memorial to Congress the convention should appoint a committee to confer with the railroads, with a view to securing a compromise, was declared by one of the millers to be a wolf in sheep's clothing. One member moved that a representative of the railroads be allowed to speak on the resolutions which were before the meeting, but his motion was voted down.

The *Northwestern Miller*, quoting a statement that the convention "accomplished its purpose to the fullest extent," says that, as the chief purpose was to provide comfortable winter quarters in Washington for the prime mover of the whole thing, the statement is correct. It is claimed that only a few of the 39 participants in the convention really represented actual shippers. The majority, it is claimed, were "salaried functionaries or pro-

fessional secretaries." The statement in the memorial that the Cullom bill "has been freely discussed in the public press with almost unanimous approval" is declared to be far from the truth; as also the assertion that there is a demand from all sections of the country for its immediate enactment. Mr. Decker, Assistant Secretary of the Interstate Commerce Commission, was present at the meeting. Summing up, the *Northwestern Miller* says that Mr. Simmons' views are the same as those held by itself a year ago; that the Cullom bill is as dead as a smelt and no one conversant with the facts believes it will be seriously considered by Congress. "Doubtless there are abuses in the transportation business and discrimination in rates is one of them, but the Cullom bill is not the remedy. If this bill should show signs of passing, the real shippers, like Mr. Simmons, would come together and kill it."

Annual Reports.

Rio Grande Western.—The record of the last fiscal year shows a gain of 47 per cent. in ton-miles and of 30½ per cent. in passenger-miles. The gross receipts were $4,511,000, exceeding those of the previous year by 34½ per cent., and the highest in the company's history. There was a relative falling off of operating expenses from 62.17 per cent. of the gross receipts to 60.21 per cent., and the net earnings increased $526,000, or 41½ per cent.

The total mileage operated on June 30 last was 636.83, against 584.38 miles a year earlier, a net gain of 52.45 miles. Among the new branches added, all in Utah, were the line from Provo to Heber, 26 miles; the Sunnyside branch from Mounds to Sunnyside, 17.23 miles, and the Pleasant Valley extension to Clear Creek, 5.83 miles. The company expended $188,500 for betterments, and expenditures for new equipment were $406,100. These last comprise 417 box cars, 97 stock cars, 25 steel coal cars, 12 cabooses, besides 11 passenger and baggage cars.

The ton-miles of freight carried this year were 287 million against 195 million the preceding year, a gain of 47 per cent. At the same time there was a drop from 1.276 cents to 1.182 in the average rate per ton-mile, so that the total freight receipts showed a gain of 36½ per cent. this year, being $3,395,000. The average trainload of revenue freight was 213 tons against 183 tons in 1899, and 194 tons in 1896, the highest previous record. There was a slight increase in receipts per passenger mile from 1.91 cents to 1.93 cents. The total passenger receipts were $932,600, a gain of 32.3 per cent. Receipts per passenger train mile advanced from $1.0982 in 1899 to 1.2044 this year.

Atlantic Coast Line.—The last fiscal year of this company, closed June 30, is marked by the consolidation into one company of the several lines closely allied, which took effect May 1 last. The system now comprises 1,758.8 miles, formerly divided among the Atlantic Coast Line of Virginia, the Norfolk & Carolina, the Wilmington & Weldon, the Southeastern of North Carolina and the Atlantic Coast Line of South Carolina. The capital stock of the consolidated company is $34,280,500, of which $15,890,200 is common and $18,390,300 preferred. The funded indebtedness amounts to $18,546,500, besides $5,880,000 of certificates of indebtedness and special trust certificates. These make a total of $24,426,500 on which the interest charge is $1,186,835.

Gross earnings for the year were $7,587,000, a gain of 22 per cent. over the receipts of the same roads for the preceding year. Operating expenses were $4,312,000, which was a gain of 21 per cent. The net receipts were therefore $3,275,000, or 23 per cent. The percentage of operating expenses to gross income was 56.8 per cent., against 57 per cent the year before. There was a gain of 33.9 per cent. this year in the freight ton-mileage, accompanied by 27.9 per cent. increase in the freight revenues. The passenger mileage fell off 2.4 per cent., but the passenger revenues were 10.6 per cent. higher.

Additions of lines made during the year comprise an extension of the old Manchester & Augusta in South Carolina from Denmark to Robbins, 34.71 miles, opened for freight Nov. 1 and for passenger business Dec. 1, 1899; also an extension of the Southeastern of North Carolina from Ashpole to Boardman, 10 miles, opened June 11, 1900. The Northwestern of South Carolina, closely affiliated, has extended its line to Camden. The Atlantic Coast Line, on Dec. 1, 1899, began running its trains into Augusta, Ga., using 28.8 miles of track of the Charleston & Western Carolina from Robbins. Ten miles of the old Petersburg R. R. was relocated, saving one mile in length and 537 deg. of curvature. The company has also decided to spend $40,000 in taking out two reverse curves on another section of the same road, to be finished this year.

The increased tonnage handled has necessitated large additions to the rolling stock. Including the cars built at the company's shops, there were added, up to Dec. 1 last, over 1,000 freight cars (11 passenger coaches and 13 locomotives, all to be paid for out of operating expenses.

Passenger earnings per mile of railroad are on the average not half as great in France as in England, but a little (5 per cent.) greater than in Germany. Freight earnings per mile are in England nearly twice as great as in France, but only 12 per cent. greater than in Germany. For the three years ending with 1898 freight earnings were practically stationary in France, while they increased nearly 5 per cent. in England and more than 7 per cent. in Germany. The total earnings per mile were in that year:

England.	Germany.	France.
$21,157	$14,712	$10,329

The proportion of earnings to expenses differs less than might be expected, being, for the above countries, in their order, 58.5, 59.6, and 54.4 per cent., respectively. Not so many years ago, expenses above 50 per cent. of earnings were looked on askance in England, and probably they are still regarded there as evidence of an increase in working expenses. The cause, doubtless, has been, however, not an increase in expenses per unit of traffic (for the art of railroading does not progress backwards in England), but lower average rates. Unfortunately that cannot be proved there, for lack of any data concerning ton and passenger mileage. But as downward has been the direction of rates substantially all over the world, and England has to compete with the rest of the world; we can safely assume that rates have gone down there, too. Here, where freight at least is carried at less cost than anywhere else, some of the pattern railroads use 70 per cent. or more of their earnings for expenses.

The Chicago & Alton has notified its conductors, enginemen, firemen, station agents and some other employees of the operating department that prizes will be awarded to them twice a year for faithful and efficient service free from errors. The prizes for conductors and enginemen will be $20 each. Mr. S. M. Felton, now President of the Alton, introduced prizes on the Cincinnati, New Orleans & Texas Pacific, of which he was Receiver, and the very satisfactory results on that road have been reported in the *Railroad Gazette* (Feb. 5 and April 2, 1897; April 29 and May 20, 1898). The fact that he adopts a similar plan on the Alton gives additional evidence that the experience on the C., N. O. & T. P. was successful. Mr. Felton does not confine the giving of prizes to iron-clad rules, but makes variations where occasion requires. We learn that on the C., N. O. & T. P., after a very heavy movement of troops during the mobilization of 1898 he ordered an extra month's pay given to each of the Division Superintendents and Train Despatchers, the innumerable special passenger trains having been handled without the slightest mishap. We have not the details of the Alton regulations; but an essential feature of the scheme is that the bonuses shall be paid, not to the one person making the best record, but to every one whose records reach a certain percentage of perfection.

In reporting on a rear collision, due to a signalman's blunder, which happened on the Lancashire & Yorkshire near Liverpool Aug. 25, Major General Hutchinson, Inspector for the British Board of Trade, says that "it is most desirable that special means [electrical control by locks], such as are now becoming common on many of the principal railways, should be adopted for preventing . . . signalmen from making such mistakes as this." *Transport*, commenting on this, says that the advice is good, but that, in view of the fact that General Hutchinson is Chairman of the Sykes Signal Company, his continuance in his position under the Board of Trade is nothing less than a scandal. In the case of another collision about the same time, reported on by Colonel Yorke, it appeared that the home signals of two signal boxes were only 426 ft. apart, which distance, says the Inspector, is inadequate and insufficient. One home signal is 732 ft. from its cabin, and this, says the Inspector, is too far. If it had been nearer, the signalman would have seen the engine standing there, and would thus have avoided the mistake which he made.

We have already noted the fact that one of the Swiss railroads is to be taken over by the Government earlier than was expected. It is the Central. The Government has made a contract by which it purchases the property instead of condemning it under the terms of its charter, and will enter into possession Jan. 1, 1901, instead of May 1, 1903, as would be the case otherwise. The state is entitled to take over the railroads at a certain time and at a valuation to be fixed according to certain rules. A few years ago a law was passed concerning the auditing of the accounts of the railroads, the object of which was to enable the Government to establish more accurately the price which it would have to pay, but this has been, in large part, set aside by the Swiss Supreme Court; and there was a good deal of controversy as to the interpretation of the rules fixing the price, the shareholders claiming that the Government interpretation was in many respects grossly unjust. By making contracts with the companies litigation will be avoided. It is expected that the Government will make, or at least attempt to make, similar contracts with the other companies. Meanwhile, the Central's lines are to be worked next year by the company for and on account of the state, which would hardly be able to complete an organization in the short time before next January.

The official report for the Hungarian railroads for 1899 shows a total of 10,529 miles in the Kingdom, of which 543 miles is double track road. The capital of these railroads is $626,228,498, or $59,465 per mile of road. Only 2,057 miles of the total is worked by companies, but companies own 3,719 miles which the state works. The passenger traffic in 1899 was at the rate of 185 persons moved each way daily over the whole system (here 107); the freight traffic was equivalent to 443 tons each way daily (here 903); in connection with which it is well to note that there were in Hungary 1,800 inhabitants per mile of railroad; here, 394. The average receipt in Hungary was 0.902 cent per passenger mile and 1.077 cents per ton-mile; in this country, 1.925 and 0.724 respectively. The gross earnings of the Hungarian railroads were $4,991 per mile; the net, $2,260. The number of employees was 85,557—8 per mile of road. Their average yearly pay was $212. The employees are classed as "officers," "sub-officers," women, servants and laborers, and not one-eleventh part are in the first class, which on German railroads includes nearly one-half; about one-eighth, however, are sub-officers; nearly one-half laborers. Only 404 are women. The average pay of officers was $543 per year; of sub-officers, $323; of servants, $190; of laborers, $135; of women, $167.

The newspaper dispatches inform us that the Erie Canal was officially closed Dec. 1 "after one of the most unsatisfactory seasons in years." The canal men are not pleased with the business of the season. The inquiries for tonnage have not been so large as in former years and the rates "have been abnormally low." It seems that these low rates are attributed to the railroads. "In fact, the railroad companies scarcely consider the canal as a factor in the freight market." This seems a hardship and we do not know what ought to be done about it. It is important that we should continue to run the railroads in order to control canal freights and prevent extortion on the part of canal men. In fact, it is of the greatest public importance that transportation business should not be monopolized by the greedy canal boat owners, who are famous extortionists. We do not see how the canal magnates and barons can be kept in their place except by the continued competition of the railroads. Nevertheless, something will have to be done to help them out. Perhaps it would be well to have a government subsidy based on the number of mules worked by each baron.

The Russian railroad reports compare the value of the different fuels used on locomotives. The report for 1897 says that 63 lbs. of Caspian petroleum were equivalent to 100 of English coal or Donez (Russian) anthracite. In previous years the value reported has been as 69 to 100. For every 1,000 locomotive miles 3,348 lbs. of petroleum were consumed. In 1897, the petroleum used on engines in Russia cost more than the coal, but only a very little more. This fuel cost more, however, per engine mile, than either coal or wood. The average cost of the petroleum used was 44½ cents per 100 lbs., of coal 25 cents. Of the coal used, 68 per cent. comes from the Donez; but only one-fourteenth of this is anthracite. The other chief source of supply is the Polish mines, which afford about one-third as much as the Donez field. A little more than 400,000 cords of wood were used. On the scale of values four-fifths of a cord is given as equivalent to a ton of English coal.

NEW PUBLICATIONS.

The Official Guide, for December, contains a list of the railroads which have undergone a change of name during the past five years. This list, unlike the list of old names which has been published in the *Guide* for many years, and which is a regular feature, shows the new name in the first column; as, for example—

New Name or Name of Operating Company.	Old Name.
Albany & Hudson	Kinderhook & Hudson.
Albert Southern	Harvey Branch Ry.
Atchison, Topeka & Santa Fe	See Santa Fe.
Baltimore & Ohio	Baltimore & Philadelphia.
	Eastern Ohio.
	Monongahela River.
	Pittsburgh, Maysville & Cincinnati.
	West Virginia & Pittsburgh.
Baltimore & Ohio Southwestern	Indiana Southern (in part).
Boston & Maine	Fitchburg.
	Portland & Rochester.
Erie	Daguscahonda.
	Daguscahonda & Elk.
	New York & Greenwood Lake.
Santa Fe	Burlingame & Northwestern.
	Hutchinson & Southern.
	Manhattan, Alma & Burlingame.
	San Francisco & San Joaquin Valley.
	Wichita & Western.
Santa Fe Pacific.	Atlantic & Pacific.

The reader will observe that the second column does not contain all of the smaller roads incorporated into a larger one; but only the more recent acquisitions. The treatment of the Atchison, Topeka & Santa Fe in this list is in accordance with the custom which prevails in the *Official Guide* office, of making the advertising name (or perhaps we should say the popular name) of certain roads more prominent than the corporate name. This, we suppose, is done at the request of the advertising department of the several roads; but in such a methodical work it seems rather illogical.

TRADE CATALOGUES.

Wood Working Machinery.—The S. A. Woods Machine Co., of South Boston, Mass., send a handsome cata-

logue of wood working machinery. It is a quarto volume of 114 pages with index and numerous illustrations. The company is giving particular attention to developing and building the most improved wood working machinery for car and coach building. Many of its tools are also adapted to the requirements of modern pattern and carpenter shops, being thoroughly up to the times.

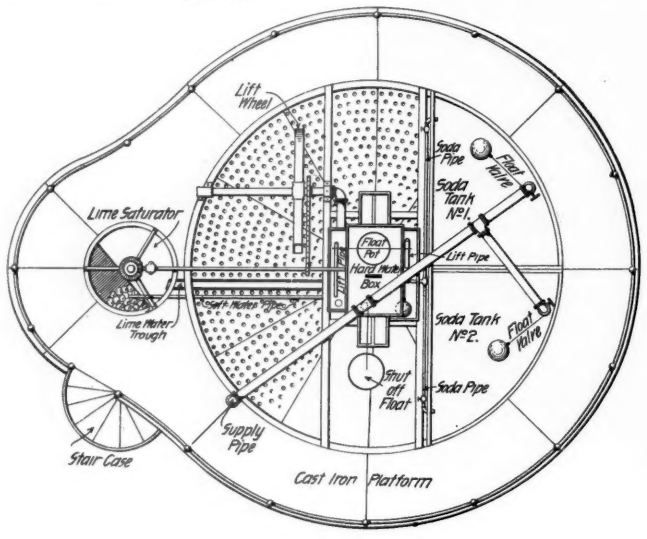
A Continuous, Automatic Water Purifier.

A continuous water purifier based on the use of lime and carbonate of soda is now being put on the market by the Industrial Water Purifier Co., Chicago (which should not be confused with the Industrial Water Co., New York), and is designed to be wholly automatic while avoiding the complicated construction of European machines of this type. The Desrumaux apparatus, used extensively in Europe, was illustrated in our issue of Sept. 7 last, and is criticized in that the settling of the precipitate takes place against the current of the water, or, in other words, as the water rises from the bottom of the settling tank the precipitate falls. This is avoided in the apparatus here described, while another feature is the use of purified water for dissolving the lime. Where the lime is dissolved in hard water it is found necessary to about double the amount of lime called for by the analysis and the explanation is that the hard water coming in contact with a piece of lime forms a coating of precipitate around it which retards further solution.

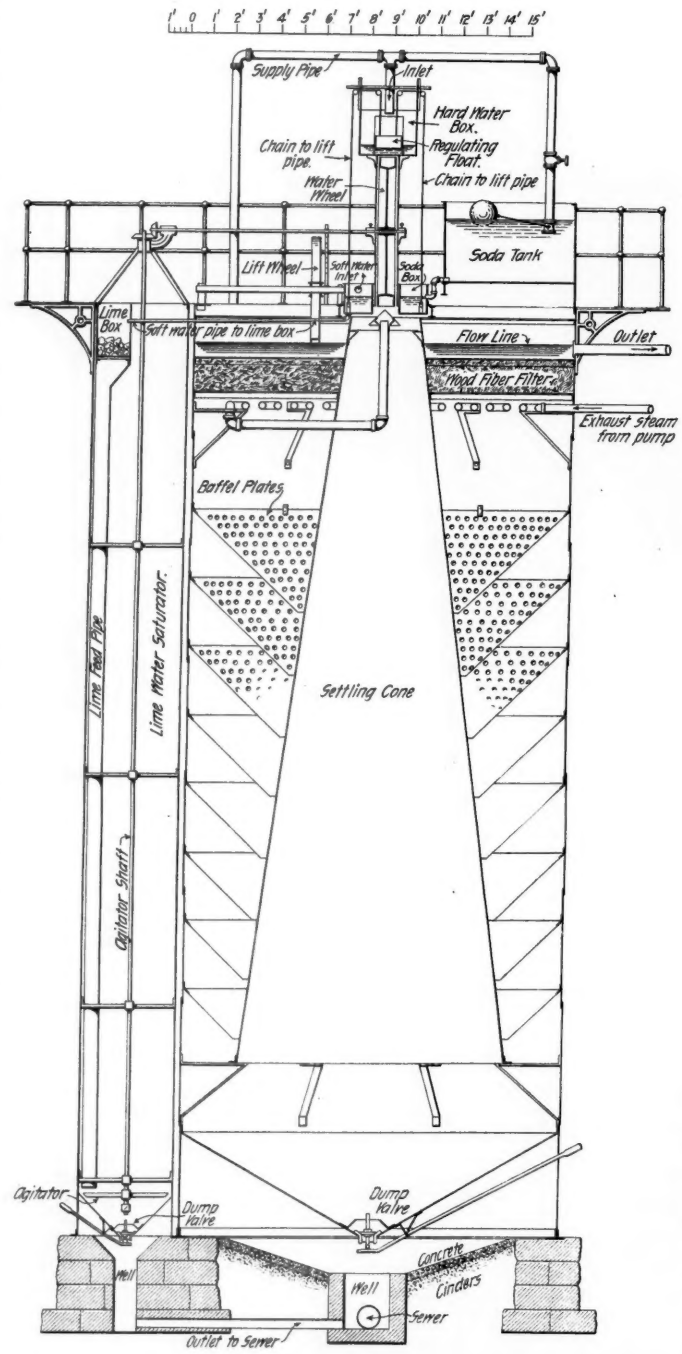
The construction of this apparatus as made of metal is shown by the accompanying engraving. It is essentially a steel settling tank having a conical bottom. A dump valve, operated by a lever, is placed at the lowest point and discharges into the sewer. The overflow for the purified water is near the top of the tank. The water to be purified enters through the supply pipe at the top and flows into a box having a slot in the bottom. Through this slot water is admitted above a water wheel, which is used to drive auxiliary apparatus. After passing over the wheel, the water enters a compartment at the top of the conical conduit, where it mingles with the lime and soda solutions. As the water flows down this conduit, the rate of flow decreases as the cross-section of the cone increases, and it will be noted that the precipitate falls away from the water as it descends and collects in the conical bottom of the tank in the form of mud. This mud is blown out periodically through the dump valve.

The cross-section of the base of the cone is approximately equal in area to the cross-section between the cone and the sides of the tank. The cone serves an additional purpose in that it holds the small particles which will not settle until they are caught and carried down by heavier particles from above; the cone serves as an oil trap in case it is also required to use water condensed from the exhaust of engines. The water after leaving the cone turns and flows upward to the overflow, constantly decreasing its rate of flow because of the increase of cross-section. In this space also is a series of baffle plates, and finally after passing through a wood fiber filter the purified water passes out through the overflow pipe. It is found that most of the precipitate settles within the cone, due no doubt to the direction of the flow being downward. When exhaust steam from pumps or engines is run into the purifier, a series of condensing pipes is arranged as shown and the water of condensation is introduced at the top of the cone beneath the small conical cap.

Alongside the large settling tank is a lime-water saturator which consists of a small tank, also provided with a conical bottom and dump valve. At the bottom of this tank are paddles which are driven by the water wheel through a system of shafting and bevel gears. The lime is placed on a grating near the top of the saturator, where it is slacked and falls to the bottom through a large pipe. As previously said, soft or purified water is used in dissolving the lime, and this water is raised by a lift wheel having cycloidal arms which dip up the water and deliver it through the hollow shaft to a box which is kept at a constant level and full to the overflow. This water lift is driven from the main shaft by a chain belt and runs continuously. The soft water in this box enters the pipe to the lime saturator through a slot near the end of a branch pipe which can be raised and lowered. When the pipe is raised so that the opening is near the surface, a small amount of water passes to the saturator and the quantity delivered is increased by lowering this pipe beneath the surface. The lime solution passes from the saturator to the chamber at the top of the cone through a trough, so that the lime solution which leaves the steurator is equal in amount to the soft water delivered to the saturator. The amount of lime solution delivered to the purifier is thus regulated by raising and lowering the branch pipe in the soft water box.



Plan.



Vertical Section.

The Apparatus of the Industrial Water Purifier Co.

There are two large soda tanks either of which can be used which deliver the soda solution into a box alongside the water wheel; the level of the solution in this box is kept constant by a float which operates a valve in the pipe from the soda tanks. This box also has a pipe leading from it to the chamber at the top of the cone and the solution enters through a slot in the end of a branch which can be raised or submerged, regulating the amount of soda solution delivered.

The automatic regulation is quite simple. A float on the surface of the purified water regulates a valve in the supply pipe leading from the pumps, and so governs the working of the apparatus in accordance with the demand. In turn, the amount of lime and soda solution delivered to the apparatus is governed by the amount of the supply water furnished. The supply water leaves the hard water box through a slot in the bottom and an increase in the amount of water delivered to the apparatus raises the water level in the hard water box and consequently raises its float. This movement, through chains and pulleys, lowers the ends of the delivery pipes in the soft water box and in the soda solution box, until the ends of those pipes are below the surface a distance equal to the head of water above the slot in the hard water box. In this way a given proportion of chemicals to water can be maintained automatically for a wide range of working. The openings in the hard water box, soft water delivery pipe and soda solution pipe are proportioned to deliver the proper amount of chemicals to suit the water; the regulating apparatus maintains equal heads above all three openings.

The only attendance required is in blowing off once in about 12 hours and in recharging with lime and soda ash every 12 to 24 hours. Such a purifier as described has been in use at the refrigerating plant of the Consumers' Company, Chicago, for eleven months, treating Lake Michigan water for boiler purposes. The cost of chemicals used in treating water at this plant is about eight-tenths of a cent per 1,000 gals. This purifier has a capacity for 5,000 gals. of water an hour. The records of the Consumers' Company show that in making ice during April and May of this year an average of 16.6 per cent. less coal was used per ton of ice than for the corresponding period of the previous year. This reduction is held to be due to the increased efficiency of the boilers which are now free from scale. The analysis of this water before and after treating is as follows:

Analysis of Water.

	—Parts per 100,000.— Before treatment.	After treatment.
Calcium carbonate	6.90	1.51
Calcium sulphate	0.58	0.26
Magnesium carbonate	3.23	1.01
Magnesium sulphate	0.85	trace
Silica	0.60	0.32

Lake Michigan water is considered very good for steam boilers and the showing which has been made in this case is striking. As is well known it is much easier to treat very hard waters than those of only moderate hardness. A number of plants of the kind are now being built.

The Corrosion of Iron.

Mr. Carl Hambuechen has made a study of the corrosion of iron, and the results, as presented in a thesis, are published in a recent *Bulletin* of the University of Wisconsin. This study leads to the belief that the most plausible explanation of the corrosion of iron is an electrolytic one. While it is commonly thought that the corrosion of iron in salt water is largely due to electrolytic action, we do not know that any one before has attempted to account for ordinary corrosion of iron in this way. One reason for this belief is that the conditions necessary for corrosion are the same as the conditions which are necessary for electrolytic action.

The conditions for electrolytic corrosion may be said to be: Two or more conducting substances in contact with an electrolyte; a difference of electrical potential set up between such bodies, and connection between the conducting substances furnishing a path for the flow of current. These conditions are all found to be co-existent with the corrosion of iron, the electrolyte in that case consisting of moisture which may be in contact with the iron body. The difference of potential may be set up in various ways. The iron, which is never absolutely pure, may have in electrical contact on its surface foreign materials such as carbon, graphite, various metals and some metallic oxides which will conduct. Each of these substances sets up an electric potential peculiar to itself when immersed in an electrolyte, and it is held that as these differently charged bodies are in contact a flow of electricity is set up, the current being completed through the electrolyte. It is well known that an electric current flowing from iron to an electrolyte causes an eating away of the iron. Experiments to demonstrate this point show that any substance in contact with iron which, in the electro-chemical series is more electro-positive than iron, will tend to protect it; such substances including magnesium, aluminum, zinc and cadmium. The more electro-negative substances like lead, antimony, tin, copper, silver, carbon and some metallic oxides, on the other hand, promote the corrosion of iron. An example of this action is shown by the "pitting" of steam boiler plates, where it is frequently observed that each corroded spot has in its center a small piece of cinder or carbon, thus centralizing the corrosion about that point.

In the experiments at the University of Wisconsin, advantage was taken of this to hasten the corrosion of metals by causing a current, generated externally, to

flow from the iron to the electrolyte. In this way and by using a suitable electrolyte an effect was got in a few hours which would require an exposure to the weather of probably as many years. From many tests it is found that the effects produced by ordinary corrosion and by electrolytic corrosion are similar and for experimental investigation the advantage of this rapid method is apparent. The results of the experiments are reported in full in the *Bulletin* but only a few of the principal points will be noted here.

The appearance of different test pieces of similar qualities of iron is much alike after corrosion by the electric current, but different qualities of iron present marked differences in appearance. The surface of the cast-iron specimens consisted of soft carbonaceous material which, under some circumstances, adhered very firmly to the surface of the iron. It was found that if the current density was carried beyond 0.025 amperes per square inch, this soft material separated from the iron after attaining a certain thickness. The sheet iron specimens were covered with a soft spongy material which could be readily removed with a brush and the metal below this coating had a bright appearance. Tool steel specimens were also covered with a layer of spongy material, but below this layer was a thin layer of black carbonaceous material similar to that of cast iron.

If the current density is not excessive, to all appearances, cast iron may not undergo any material change even though subjected to the action of the current for a long time. But although the general form and outward appearance may remain the same, it is found that in fact the surface material is softened, and the material which can be removed by scraping with a knife looks like fine iron filings or graphite. If allowed to stand and dry, the coating becomes much harder but evidently the strength of the iron is impaired. Such corrosion has been frequently observed in cast iron pipes exposed to the action of electric railroad currents, the pipe in many cases retaining its original form, but possessing little strength, as shown by the use of a hammer and chisel. Cast iron is usually credited with being much more durable than other forms of iron for underground pipes exposed to the action of leakage current from electric railroads. It is thought that this may be due to several different causes, principal among which are the following: The fact that the cast iron may not change its form and general appearance even though it has been weakened by electrolysis, might convey the erroneous impression that it is still intact, while a wrought iron pipe exposed to the same conditions would quickly reveal its weakness to casual inspection. This graphite-like coating forming on the cast iron may become hard and impart a certain amount of strength to the corroded pipe, while a wrought iron pipe equally corroded is not similarly favored. It may seem that a cast iron and a wrought iron pipe are equally subjected to the corrosive action of the electric current while this may not be the case, due to the formation of the layer over the cast iron, which must offer some resistance to the flow of the current, and therefore protect it to a certain degree. Or, in other words, other conditions being the same, a given potential difference between an iron pipe and railroad track will cause less current to flow if the pipe is of cast iron than if it be of wrought iron. The conclusion is drawn from the Wisconsin experiments that a given amount of current flowing from normal cast iron and normal wrought iron will cause an equal amount of corrosion in the two.

Tests were made to determine the corrosion of "strained" metal using iron, zinc, copper and brass specimens. It is found that "strained" metal will corrode faster than "unstrained" metal, which confirms certain observations with punched boiler plates, but on this point the results are directly opposed to the conclusions of Mr. Thomas Andrews, published in papers before the British Institute of Civil Engineers. As to this, however, it is thought that the experiments at the University of Wisconsin are more thorough and reliable than those made by Mr. Andrews. The explanation of this is that strained metal has a higher electro-motive force than unstrained metal, consequently the electrolytic action will be increased and in turn the corrosion. This was verified by careful experiments, where, under both tension and compression, the electro-motive force was found to rise as the stress increased and this increase in electro-motive force appears to follow closely the elongation produced by the stress. No marked changes of electro-motive force occur until the elastic limit is reached, after which there is a rapid rise. Experiments show that this rise in electro-motive force of a specimen under tension or compression is not due to the increase of temperature of the specimen.

Feed Water and Boilers.

Many cases have come under our observation in which the horizontal tubular boiler has been successful when some other type has proved unsatisfactory, or perhaps could not be operated at all. The reason for this is not hard to find. When properly proportioned, with wide spaces between the tubes, and between the tubes and the shell, the horizontal tubular boiler is accessible in nearly every part for cleaning, while most of the other types are not. As a concrete example, let us consider a horizontal tubular boiler, 72 in. in diam. and 18 ft. long inside, having a total heating surface (or surface in contact with water) of some 1,500 sq. ft.; and let us compare it with a vertical tubular boiler having substantially the same heating surface. If these two boilers take their feed water from the same supply, and evaporate the same quantity per hour, the total solid matter deposited in any given time, either as scale or sediment, will be the same in each. Scale formed upon the tubes in either boiler is constantly loosening and falling down, so that it collects at the bottom of the boiler. In the vertical tubular type some scale and sediment will pass over into the water leg around the fire-box, and lodge there. A great deal, however, especially in the larger sizes, will be retained by the tubes, and lodge upon the tube-sheet, directly over the fire. The surface upon which the scale can lodge here is limited, of course, to the spaces between the tubes; and if we consider a vertical tubular boiler having substantially the same heating surface as the horizontal tubular whose dimensions we have already given, we shall find that the total area of the tube sheet is about 28 sq. ft. The tubes remove some 6 sq. ft. of this, and there remain

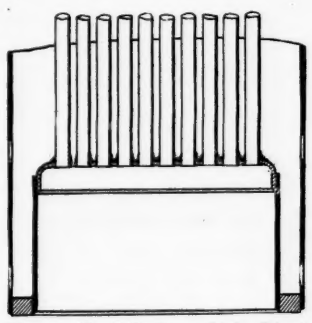


Fig. 1.—Hard Scale on Tube Sheet.

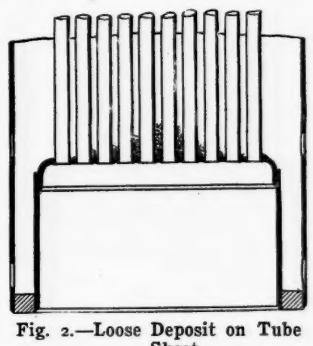


Fig. 2.—Loose Deposit on Tube Sheet.

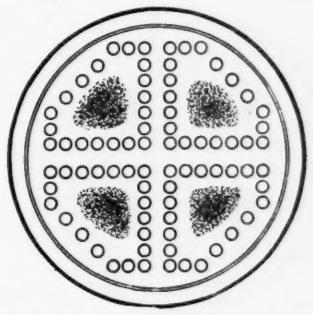


Fig. 3.—Deposit on Tube Sheet When Spaces Are Kept Free.

but 22 sq. ft. upon which the scale and sediment will accumulate. In the equivalent horizontal tubular boiler the deposit may lodge anywhere on the lower half of the shell. Now it is easily shown that the area of the lower half of the shell of the horizontal boiler is 170 sq. ft. The surface upon which the deposit may collect is therefore eight times as great in the horizontal tubular boiler as it is in an equivalent boiler of the vertical type. It is true that the shell of the horizontal boiler is so steep at the sides that loose scale is not likely to collect there to any great extent, until the lower parts are pretty well covered. Making all due allowance for this, however, the fact remains that the effective area for the lodgment of sediment and loose scale is several times as great in the horizontal tubular boiler, as it is in a vertical tubular boiler of equal evaporative power.

The point of all this argument is, that when a horizontal tubular boiler, and a vertical tubular boiler of the same evaporative power are run side by side at the same duty and with the same water, the sediment and loose scale which collect at the bottom in any given time will be several times as thick in the vertical type as it is in the horizontal one.

Continuing our comparison of these two types, we may remark that the greater thickness of the deposit in the vertical boiler is of far more importance than its mere numerical measure would indicate. For in the horizontal type the deposit does not cover anything except the shell plates and the girth joints; whereas in the vertical type it buries the tube ends, and keeps the water away from the expanded joints by which they are secured to the tube sheet. These expanded joints are very sensitive to abnormal increase of temperature, and a slight degree of overheating will often start them and cause them to leak badly. Since the tube sheet and the lower ends of the tubes are exposed to the most extreme heat of the furnace, there will be a deposit of scale upon these parts, directly from the water, on account of the rapid evaporation there. If the water contains lime and magnesia, this scale will be likely to be hard and stony. It may cover the spaces on the tube sheet, between the tubes, to a thickness of from 1-16 to 3-16 of an in. or more, building rings around the tubes at their junction with the tube sheet. This action is indicated by the dark spots between the tubes in Fig. 1. Scale deposited in this way is a common cause of obstinate leakage at the tube ends, and of injury to the tube sheet. The removal of such scale is always difficult, and it is often impossible without removing the affected tubes.

Passing now to the source of trouble upon which we have especially dwelt in comparing these two types of boiler—namely, to the accumulation of loose scale and sediment upon the fire sheets—we shall find that this deposit will tend to collect in the vertical boiler somewhat in the manner indicated in Fig. 2, the deposit being heaviest in the middle of the tube sheet, and gradually lessening in thickness toward the edges. The tubes near the middle will leak worst, in case of a deposit of this kind, because the water is kept away from them most effectually by the greater depth of the deposit. When care is taken to keep the spaces in front of the handholes clean, the deposit can no longer collect in a single mass, as represented in Fig. 2, but will be massed in four smaller heaps, among the tubes which are separated by the spaces that are kept clean. It is difficult to represent this state of affairs in an illustration, but the attempt to do so has been made in Fig. 3, which represents the tube sheet of a vertical boiler. Most of the tubes have been omitted in the cut for the sake of clearness, and the four regions of heaviest scale deposit are indicated by the four shaded regions. In cases of this kind there is usually little or no leakage along the spaces in front of the handholes, but the tubes leak in clusters of from six to twenty, around the middle of the shaded areas in the cut.

This article is not intended as a condemnation of the vertical tubular boiler, for this type often gives excellent service when it is run with a suitable feed water, and receives proper care. Moreover, there are many other types of boiler that are poorly adapted for waters that contain considerable quantities of solid matter, and which form scale rapidly. We have selected the vertical tubular boiler for the comparison because it is a type familiar to everybody, and because it was necessary to select some particular kind of boiler, in order to illustrate our general proposition, that under certain conditions one type of boiler may prove entirely satisfactory, both as to economy and as to durability, while other types may not be adapted to these conditions, and perhaps cannot be run in the same place without considerable waste of fuel, and frequent bills for repairs. Constructing engineers, mill owners, and steam users generally would do well to consider this point carefully, when designing or installing steam plants.—*The Locomotive.*

Imagination in Mechanism.*

BY PROF. C. W. MACCORD, SC. D.

The designing and construction of machinery are very generally regarded as the most practical of occupations. To the inventor it will be conceded that some play of the imaginative faculty is vouchsafed while in the struggle of projecting a new scheme or devising some new combination. But when the novel idea has crystallized into a definite form, and nothing remains but to reduce it to vulgar fractions of feet and inches, "to put it into a practical, working shape," it is commonly supposed that the work of the imagination is done, and that the completion of the task is a matter of mechanical labor, pure and simple. . . . It is hardly too much to assert that the very reverse is true—that the successful elaboration of a well-proportioned working machine in detail, from a general idea of the nature of its functions and movements, makes a greater demand upon the power of imagination than the origination of the general idea itself. . . . The inventor of mechanism, as such, is untrammelled by matters of detail in dimensions and proportions. The object which he seeks to attain, whether it be old or new, is definite, to be sure; but when he conceives a novel arrangement of parts whose mutual relations are such as to serve his purpose, his conception of those relations is, from the very nature of the case, a general one. Vivid it may be, but all space as yet is his, and precisely how he will divide and apportion it he has yet to determine; the truth of which is attested by the fact that not one invention in a thousand is introduced in the form first suggested to the imagination of the inventor.

The designer of mechanism, however, begins where the inventor leaves off; for him not only the object but the manner of attaining it are fixed. His field of action as compared with the inventor's, is therefore limited on the one hand; but on the other it is extended, since he is required to reduce everything to definite forms and positive dimensions, such as shall not only adapt each part to the peformance of its own duty, but permit the harmonious working of the whole. In either case the mental conception must precede the physical execution. . . .

Whence, then the false idea that the designer is a mere calculating machine, to whom an imagination is a superfluity? It comes from too hasty generalization; since he has only to plan details, it is taken for granted that he can do it in detail—first this piece, then that, and finally the other, and then put the whole together like a book-keeper footing up an account. . . . The actual order of proceeding is substantially the reverse of that indicated; a general plan being first devised, subject, of course, to modification as the work progresses, which it usually does by the designing of the details as nearly as may be in accordance with this plan. Consequently, the designer is called on both to grasp fully the nature and functions of the machine before beginning his proper task, and to conceive of the details, not individually, but in relation to each other and as parts of a connected whole. . . . The inventor mentally sees a new combination;

*Extracts from an article in the Stevens *Indicator*.

the designer mentally sees what is new in form, size, or arrangement, if not novel in mode of action. And the more clearly he sees it, the more sharply defined the mental image of the work upon which he is engaged, the greater will be the facility with which he can proceed, and the more satisfactory will his progress probably be. This is true, even if the designer be required to adhere to a stated general arrangement of details. But that is not always so; he is frequently called on to exercise judgment in selecting, and also inventive ability in devising, the best means of effecting certain results which, being themselves new or leading features of the machine, may yet be accomplished in various ways. In order to proceed intelligently under these circumstances, it is necessary to make mental comparisons between different arrangements of details mechanically equivalent in operation, which as yet have no tangible embodiment or visible representation. And the ability to do this, depending solely on the play of the imagination, will be great in direct proportion to the vividness of the mental conception . . .

The designer records his plans in his graphic language —he makes sketches, more or less accurate; but they are the evidence of things not seen—they represent the substance of things hoped for. And even with their assistance, be they ever so accurate, the fact remains that to form what may be and often is called a clear physical conception of what they represent—that is, a mental conception so vivid as to render unnecessary an actual physical embodiment or working model—requires an imaginative faculty of no mean order. . . .

Like all other mental faculties, this power of imagination may be cultivated and developed. Its native intensity, like others, varies greatly in different individuals; but if it be wholly lacking in any, it is safe to assume that it is not so in one who is in other respects fitted for any pursuit in which it is necessary or useful. If such a one feels a deficiency in this respect, a suggestion or two as to the means of supplying it may not come amiss to him. First and most obvious of these are the study and the practice of mechanical drawing. Not that it is incumbent upon him to spend the time required to become a finished draughtsman, although the greater his proficiency in this accomplishment the greater will be the benefit in the direction here spoken of. . . . By mechanical drawing is here understood the outline representation of mechanical objects in orthographic projection. Some acquaintance with the principles involved in this projection is of course essential; this gained, it will be found of the greatest utility to compare a working drawing with the work when done, even if it be of a very simple piece. . . .

It is common to hear self-styled practical men assert that the study of descriptive geometry as an abstract science is a delusion and a snare. . . . The correct construction of the simplest working drawing is purely an application of the principles of descriptive geometry —which is none the less a fact if the draughtsman does not know it. . . .

As a means of training the faculty of imagination, the study of this science, properly pursued, is of advantage merely because it is abstract to a certain degree. . . . The best method of study not only with a view to a mastery of the science for practical purposes, but in order to develop the power of imagination, is to reason upon the problems as they come up, without making or referring to their linear representations. The magnitudes involved, although they may be physical abstractions, are yet physical, and to be conceived of as existing in space, without regard to any representations. And the power thus to conceive of them and of their relations is precisely the power we wish to acquire; and the truths which may be ultimately represented are just as true before that is done as after. The reasoning upon them is wholly independent of these representations, the whole method of making which may be thought out before they are begun. The mental effort required is greater than if the more common method of studying a problem in connection with its representation be pursued. But this effort is exactly such a one as it is desirable to make, and it is a necessity of this mode of study that a clear conception of the magnitudes and their relations, as they exist in space, must be formed before any attempt is made to represent them. And he who can thus call up vivid images of abstract things evidently will be better able to do the same with regard to material ones as yet unformed. . . . But the connection of the geometry of planes and solids with the subjects to be dealt with in the proposed application of the mechanical imagination is clear and direct. And their utility, as a means of strengthening it, is almost as obvious, by reason of their fundamental relation to the methods in which it is to be applied. The effort should constantly be made to form a clear physical conception of the magnitudes and of their relations before any representation is constructed; to imagine the successive steps of the reasoning to be conducted in space, as though the art of drawing were yet to be invented. This we repeat, not only because the greater effort is accompanied by a greater benefit, but because in this way only are the general principles to be fully mastered. A slight change in the conditions of any given case may totally alter the appearance of the representation; and no greater mistake can be made than to associate the solution of any problem with its dress on a particular occasion. He who does this may strengthen his memory, but fails in the great object of his study, whether that be to acquaint himself with the science merely for its own sake, or to derive from it the practical good that may be gained by increasing his imaginative powers.

How Business Is Done in Turkey.

Numerous statements have made the rounds of the press to the effect that the 10,000-ton rail order for the Damascus-Mecca Railroad had been placed with the Carnegie Company. According to the latest news from Constantinople, however, the order has been contracted with the Cockerill Company, of Seraing, Belgium. The proceedings leading up to the placing of this order are explained by a Constantinople correspondent, whom we think reliable.

Since the 18th of September the order for the first 10,000 tons of rails for the Damascus-Mecca Railroad, together with other material, has been in the market. The Commission fixed the 18th of September as the date for the first bid, and the Carnegie Company was the lowest bidder, at 147 francs per ton.

According to Turkish custom, however, another call for bids was issued for one week later, viz., for the 25th of September, in order that those firms able to make a 3 per cent. concession below the Carnegie quotation, might submit their prices, whereupon a definite contract was to be entered upon. As nobody could beat the American price the order remained with the Carnegie Company, whose representative, together with one of the Carnegie directors, undertook to arrange the terms of the contract and to have the latter duly signed. When everybody thought that the business had been concluded the representatives of the various manufacturers were asked to appear on the 6th of November to submit their prices again. The participation was still larger than that in September, though many of the representatives protested, pointing out that the time from Saturday night to Tuesday morning was too short to prepare for a business involving the sum of 2,000,000 francs; for, with the exception of the Cockerill representative, nobody was properly prepared for the bid. The Commission declared, however, that it was the will of His Majesty to place the order finally on that day with the lowest bidder. The proceedings resulted in the order being placed with the Cockerill Company, the latter having offered the following prices:

Rails	158 francs.
Fish-plates	208 "
Bolts	351 "
Spikes	317 "

per 1,000 kilograms c. i. f. Beyroot. In spite of the fact that a week later the contract with Cockerill had not been signed and though in the meantime other representatives who were not prepared for the previous meeting, had submitted lower prices, of which the Commission took notice, the order remained with the Cockerill Company. It should not be overlooked that the prices had to be quoted c. i. f. Beyroot in Asia Minor, and nobody could expect the manufacturers' representatives at Constantinople to prepare such a quotation over Sunday. It is rumored that the Commission had used the later, lower quotations to force the Cockerill Company to agree upon a reduction in the form of a donation to the Mecca railroad, the once quoted prices thus being maintained, and, on the other hand, the price-difference flowing as a present into the treasury of the railroad.

TECHNICAL.

Manufacturing and Business.

M. R. Muckle, Jr., & Co., Philadelphia representatives of Westinghouse, Church, Kerr & Co., have removed to offices in the Stephen Girard Building, 21 South 12th street, Philadelphia.

Simplex body and truck bolsters will be used on 700 40-ton box cars for the Cleveland, Cincinnati, Chicago & St. Louis; 100 refrigerator cars for Nelson Morris & Co., and 200 flat cars for the Chesapeake & Ohio.

John E. Tesseyman, for several years in the draughting department of the Barney & Smith Car Company at Dayton, Ohio, has been appointed chief draughtsman for the Sterlingworth Railway Supply Company, of Easton, Pa.

The Brown Car Wheel Works, at East Buffalo, N. Y., reports a largely increased business. The present plant, capable of making 250 wheels a day, will be enlarged and the capacity doubled. The works are under the management of Howard G. Brown and Henry M. Brown.

The Crosby Steam Gage & Valve Company, Boston, Mass., has decided to extend its railroad department, and has appointed Thomas R. Freeman agent in Chicago, with headquarters at 21 and 23 West Lake street. Wm. T. Johnson will direct the railroad business in this vicinity, with offices at 78 John street, New York City, and Robert Pirie will take care of the New England territory, with office at 93 Oliver street, Boston.

The Paris agent of the Rand Drill Company reports that all the compressors and drills which were on exhibition at the fair have been sold. The large Corliss compound compressor at Vincennes was bought by the firm of Messrs. J. & A. Niclausse, the manufacturers of the famous Niclausse water tube boilers, by whom it is to be used for the operation of pneumatic tools in their extensive establishment. This is the compressor which supplied the compressed air to all the American exhibits at Vincennes.

The New York Central & Hudson River has adopted the Woods' patent safety platform gate for passenger cars, to be used in connection with the service to the Pan-American Exposition next year. The gate is similar to the one used extensively by the Boston & Maine, the New York, New Haven & Hartford and many other railroads. It is made by the R. Bliss Manufacturing Company, Pawtucket, R. I. The company has recently received large orders for its gates from the Boston & Maine, Maine Central, Central Vermont, New York Central & Hudson River, New York, New Haven & Hartford and other roads. The gate has been fully illustrated and described in our columns, and is familiar to our readers. It is designed as a safety device and protection to the traveling public.

Iron and Steel.

The American Bridge Co. has a contract for 34 bridges for the Uganda Railway in Africa.

The American Bridge Co. is furnishing from one of its Chicago plants 36 plate girder spans for the Rio Grande Western Railway.

At a meeting in New York on Friday of last week of representatives of the leading iron and steel companies the price of steel plates was advanced $1 per ton.

The Lorain Steel Co. resumed work on Dec. 10 at its blooming, converting, finishing and shape mills, with about 3,000 men. The blast furnace will probably shortly be resumed.

The blast furnaces operated by the Union Iron & Steel Co., Ironton, Ohio, was sold at Sheriff's sale Dec. 3, to the New York & Ohio Iron & Steel Co. for $50,000. The purchasers held the first mortgage bonds.

The vessels built in the United States and officially numbered from June 30, 1900, to Nov. 30, 1900, were 495, of 149,963 gross tons. The principal items of the total are seven steel steamships on the Great Lakes (34,933 gross tons), and four smaller steel steamships (8,456 gross tons, which could pass through the new Welland Canal), and one steel schooner barge (2,790 tons).

According to a Philadelphia despatch, Rudolf Dolge, Special Commissioner of the National Association of Manufacturers to Venezuela, accompanied by Dr. Alberto Smith, formerly Minister of Public Works of Venezuela, arrived in that city Dec. 10. They are reported here to place contracts for structural steel and other building material to be used in rebuilding the portion of Caracas destroyed by an earthquake on Oct. 29.

Compressed Air.

The Compressed Air Company has bought the Rome Locomotive Works and is equipping those works with modern machinery.

The Boston Channel.

It is said that the estimate of the Engineer Bureau of the War Department for the Boston 2,000-ft. channel is more than $10,000,000. The Boston committee look upon this as rather a serious obstacle to getting such legislation as they are trying to get.

Bids for Eleven Warships.

The Navy Department, on Friday, Dec. 7, opened bids for five battleships from the following concerns: William Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.; Fore River Shipbuilding & Locomotive Works, Quincy, Mass.; John H. Dialogue & Son, Camden, N. J.; Bath Iron Works, Bath, Me.; New York Shipbuilding Co.; Newport News Shipbuilding & Dry Dock Co.; Moran Bros. & Co., Seattle, Wash.; Union Iron Works, San Francisco, Cal.

Bids for six armored cruisers were received from the following: Union Iron Works, William Cramp & Sons, Newport News Shipbuilding & Dry Dock Co., Moran Bros. & Co., Fore River Works, John Dialogue & Son, and Risdon Iron & Locomotive Works, San Francisco, Cal.

Power Interlocking in England.

The Lancashire & Yorkshire is to put in, at Bolton, a large switch and signal plant to be worked by the Westinghouse electro-pneumatic apparatus. *Transport*, from which we take this item, says that the apparatus is bought direct from the Westinghouse Brake Company (London) and that the erecting is to be done by the railroad company. It is stated that the electro-pneumatic apparatus which was put in on the Great Eastern a year or two ago, is in a yard used entirely by freight trains, so that this will be the first installation on an English passenger line. *Transport* calls attention to the fact that three interesting trials of power apparatus for signals are now to be made in England; the electro-pneumatic at Bolton, just mentioned, the all-air apparatus of the International Pneumatic Railway Signal Co., at Basingstoke, on the South Western, and an all-electric apparatus on the London & North Western, designed by Messrs. Webb & Thompson.

THE SCRAP HEAP.

Notes.

The Delaware, Susquehanna & Schuylkill has notified its freight trainmen that their pay will be increased to correspond with the increase recently granted by the Lehigh Valley.

William S. Groves, Train Dispatcher of the Philadelphia & Reading, who was tried on a charge of criminal negligence in connection with the rear collision at Hatfield, Pa., Sept. 2, has been acquitted. The testimony

against the defendant was so weak that the judge instructed the jury to acquit him, and ordered the costs to be charged to the county.

In the flood of Nov. 22 the trains of the Pittsburgh & Lake Erie had to be run through water nearly three feet deep for a short distance near Pittsburgh. At one place the water stood 32 in. above the top of the rail for a distance of about 600 ft. When the flood came on, heavy locomotives were used to push passenger trains through the submerged section and another engine was attached at the front end to pull the train out; but in most cases fires in the engines were extinguished, and finally a switching engine was fixed up so that it could run through the water without putting out the fire; the grate bars were blocked up.

The Railroad Commissioners of Texas, after a public hearing, have declined to issue an order requiring the railroads leading out of Texarkana to start their trains on time. It appears that through trains often have to run very late because of the lateness of trains from St. Louis and other points outside the state, and some persons inconvenienced by this irregularity wanted to have the roads break the connections, thus making through passengers wait 12 hours. The Commissioners point out that the east-bound trains of the Texas roads are run with a reasonable degree of punctuality. The delays are as injurious to the railroads as they can be to the people, and therefore the railroads will, from self-interest, improve the conditions as fast as possible.

Argument was heard before the Appellate Division of the Supreme Court of New York at Albany, December 7, in a suit in which the New York Central challenges the right of the State Comptroller to tax the receipts of the company earned in carrying the United States mails. During the fiscal year ending June 30, 1899, the gross receipts of the company were $50,509,329; of this amount, the sum of $1,654,182 was received for carrying mails. The Comptroller fixed the sum of $20,374,602.60 as the portion of the gross receipts upon which New York state could collect a tax, under section 184 of the Tax Law, and upon this basis imposed a tax of $101,873, at the usual rate of ½ of 1 per cent. The amount thus taxed included the sum received for carrying the mails. The corporation claims that such an inclusion is unlawful, and, therefore, asks to have its tax reduced by $8,271.

The United States Supreme Court has declared unconstitutional the Minnesota law of 1895, changing the railroad tax laws of the state. The suit involved the question whether real estate belonging to the railroads and not used in the operation of the roads is subject to taxation according to its value or is excepted by virtue of a contract alleged to have been made several years ago through legislation by the state, providing that railroad companies should pay 3 per cent. on their gross earnings in lieu of taxes on all their property. The taxes of the St. Paul & Duluth were involved in this case. The law of 1895 was designed to separate the land of railroads from their other property for purpose of taxation, still retaining the 3 per cent. tax on gross earnings. The effect of the present opinion is to hold the law of 1895 invalid. The court held that the land involved in this case had been granted to the state by Congress, and by the state to the St. Paul & Duluth. Soon afterward the state had enacted legislation providing that railroads in the state should pay 3 per cent. on their gross earnings in lieu of all other taxes upon their property. The opinion sustained the view that the original legislation was in the nature of a contract, which was binding, and which could not be invalidated by the act of 1895 seeking to repeal it. The provisions of the early laws, providing for a gross earnings tax in lieu of taxes on other property, had been formally accepted by the St. Paul & Duluth, and the Northern Pacific, but not by the Great Northern. All lands owned by the last-named company must be taken off the list.

Traffic Notes.

An officer of the Texas & Pacific says that his road is bringing 100 immigrants daily into Texas from Alabama, Georgia and Tennessee.

A demurrage bureau has been established at Sioux City, Iowa, to begin business Dec. 15. The bureau will be a branch of the Western Car Service Association.

Transcontinental passenger traffic is reported to be unusually heavy, both first-class and tourist. After Dec. 26 the California Limited Express of the Atchison road will be run between Chicago and San Francisco daily.

The Yazoo & Mississippi Valley road has reduced rates in Louisiana on cotton and cottonseed, as directed by the State Railroad Commission, but it is said that the Commissioners made a modification in their original order, making the reduction less severe.

It is announced that the New York Central, the Erie, the Lackawanna and the Ontario & Western will abolish reduced rates for clergymen; the Pennsylvania, the Reading, the Central of New Jersey and the Lehigh Valley have declined to join in this advance.

Western newspapers report that the California market is now taking all of the live stock shipped out of Idaho and Nevada and is gradually extending its demands eastward. This is said already to have had some effect in diminishing the volume of business at Omaha.

Chicago reporters say that cars are now so scarce in that region that "rate cutting has practically ceased." Shippers have offered large lots of grain to the railroads, if they could have a reduction from the prevailing rate, but the grain was refused. In Minneapolis, however, irregularities in rates still continue, and "both the millers and the railroads admit that tariffs are seldom maintained more than a few weeks at a time."

Shipments of grain by lake from Chicago during the past season—April 15 to Dec. 9—are reported as 130,818,262 bushels. This is about 28,500,000 less than the movement in 1898. The conditions of 1899, when lake vessels were in such great demand that the railroads took some of the grain away from them, have not been repeated this year; the lakes have taken over half the grain sent from Chicago during the season. Shipments from Chicago this year through the Welland Canal, for export by way of Montreal, were only 2,600,000 bushels.

The chief executive and traffic officers of the roads west of Chicago held another quarterly rate-conference in New York City last week, the sessions being continued through parts of three days. The information given to the public comes through Mr. Jeffery, as heretofore, and is very general in its terms. The only detail concerning which any statement is made is the proposition to establish local committees to supervise freight rates at Kansas City, Omaha, St. Louis, St. Paul and other cities. Mr. Jeffery says emphatically that this project is not a failure; that the committees will be made effective and will be useful. But nothing is said about anything having been done by any of them as yet, though several months have elapsed since their organization was begun; and the difficulties connected with the scheme are evidently far from being settled.

Rate cutting is now a disease of such long standing, and the daily papers have so increased their forces of story-tellers that the rate situation has to be reported by most of the papers every few days, if not in every issue, the same as with the selling price of grain or cotton, whether there be any change or not. In New York this week the items were in substance mostly like this sample: "Rates in trunk line territory continue about the same as last week. Cuts by the differential roads and some of the fast freight lines are still being reported. It is feared that this condition will be carried over into next year. Fast freight lines are generally blamed by freight agents for much of the disturbance. One traffic manager said that all fast freight lines should be wiped out of existence, and if the New York Central management felt really inclined to abolish them, as was reported, it could make a good beginning by closing up the Merchants' Despatch, which, he said, was commonly considered one of the chief disturbers of the rate situation. . . . All that these lines are good for is to give the traffic managers of the roads over which they run, a chance to stand up and declare with a semblance of truth that their line is not cutting rates when large cut-rate contracts over their lines become known, and are brought up before the Freight Committee."

A New Phase of Milling-in-Transit.

There has been for some time in Austria a "milling-in-transit" rate allowed, such as that so common here at Minneapolis, etc. That is, shipments of wheat to a local point to be ground, and of the flour from that point to destination, are counted as a single through shipment, at a lower rate than the sum of the two local shipments; this to encourage milling on the line. The freight, it seems, was charged as the sum of the two locals; and then on presentation of a certificate that the grain had been ground and the flour forwarded, a rebate was paid by the railroad. Now it seems that certain ingenious persons have been making a business of forging milling certificates and collecting rebates for grain that has never been ground. One of these gentlemen has recently been sent to prison for three months, with the further cruelty that he is to have nothing to eat one day in every week.

A New Railroad to Tashkend.

Last October four parties of engineers began setting stakes for the proposed railroad from Orenburg, the eastern terminus of a railroad, on the border between Europe and Asia, some 250 miles south of the Siberian Railroad, southeastward to Tashkend, in Turkestan, the terminus of a branch of the Asiatic Midland Railroad, till lately called the Trans-Caspian. The whole line will be about a thousand miles long, nearly all through an arid country on which Tartar hordes pasture vast herds and flocks. The line will pass the north end of the salt Aral Sea about half way between the termini and the southern half will be in the valley of the Syr Darja, the ancient Jaxartes, which, where water is available for irrigation, is very productive, and yields among other things cotton, though the elevation is great and the winters are severe. This road will make a much shorter route to Central Asia, Afghanistan and India than the Trans-Caspian line, and an all-rail route. It is hoped to utilize the Syr-Darja for transporting materials, but it is questioned whether the depth required, 2½ ft., can be had over considerable stretches.

Railroad Law.

A number of interesting legal decisions on questions connected with interstate commerce are reported, in abstract, in the last issue (No. 11, Vol. 8) of "Interstate Commerce Reports." In a decision by the Texas Court of Civil Appeals it is held that a shipment from a point in one state to a point just within the line of another state, where the goods are reloaded and rebilled to final destination in the latter state to gain the benefit of rates fixed by the railroad commission of the latter state, is interstate commerce until it reaches its final destination.

The Supreme Court of Kansas decides that the legislature of that state cannot compel railroads to carry drovers free with shipments of live stock which are interstate.

In Arkansas the shipper of a car of emigrant movables demanded a reduction in his freight bill, basing his claim on the rate in the bill of lading; but this rate was below the legal tariff and the Supreme Court of the state refuses to sustain the claim. If the shipper obtained the rate by misrepresentation he was guilty of fraud; while, if the agent knowingly billed the goods at a lower rate than the tariff required he was guilty of a violation of the law and his contract did not bind the roads beyond his own.

The last case reported is that of the Louisville & Nashville versus the state of Kentucky, in which the railroad justified the violation of the long and short haul law of that state on the ground that a low rate was necessary to the longer distance point in order to give that point competition of markets in coal; but the Kentucky Court of Appeals holds that to thus promote competition is not the function of a carrier. Continuing the court says: A railroad is only an improved modern highway. It must, of necessity, be subject to public control. To hold that only railroad men understand rates, or that they shall be allowed alone to fix the rates, and that no tribunal can review their decision as to what rates are reasonable, is to put in their hands a power dangerous to the welfare of the community, and utterly out of keeping with the doctrine that they are public agencies. If it be true that the public interests require the discrimination in rates shown in this case and that no injustice has really been done, it may be that, upon presentation of the facts to the railroad commission, it would allow the rates to stand. It does not apear that the appellant has presented its case to the commission. . . .

A New Railroad in Sao Paulo, Brazil.

The Commission of Public Works of the State of Sao Paulo, in Brazil, has worked out a project authorizing the Government to grant concession for the construction of a narrow-gage railroad (1 meter gage) to connect the capital of the State with Iguape, on the Ribeira River. The Government is to grant 6 per cent. interest per year on a capital not exceeding 20,000 contos de reis (about $10,920,000) for a maximum period of 20 years, from the date of the contract. The cost of construction is not to exceed 80 contos ($43,680) per kilometer.

The Jersey Central's New Ferryboats.

As stated in our issue of Nov. 16 the Harlan & Hollingsworth Co. has a contract from the Central Railroad of New Jersey to build two ferryboats. The plans for these boats were made by Mr. H. C. Wintringham, Naval Architect, 32 Broadway, New York. They will be alike in construction and will resemble in exterior appearance the double-deckers "Hamburg," "Bremen" and "Netherlands" of the Hoboken Ferry Co. They will run between the terminal at Communipaw, N. J., and New York City.

Each boat will be 207 ft. over all, 44 ft. beam, 65 ft. over guards and 17 ft. 3 in. depth. The hulls will be of steel with four water-tight bulkheads dividing the boats into five water-tight compartments. The decks at each end and over the boiler and fire room will be of steel. There will be three boilers and one triple-expansion engine. The propellors will be of the double screw type, one at each end attached to a single shaft. Steam steering apparatus will be used, also electric lighting and steam heat. The cabins will be decorated with a wainscoting 7 ft. high, above which will be canvas panels that will be painted a tint to harmonize with the quartered oak below. The seats will be of mahogany with bent wood arms. Each cabin will be provided with a stairway leading to the upper deck. One smokestack will be used. The exterior color of the boats will be dark drab. The contract calls for the completion of one boat by July 1, the other in September, of next year.

The Cat in the Flywheel Again.

A Sheboygan, Wis., press dispatch says: "A maltese cat jumped into a flywheel of the Plymouth Refrigerator Company's engine, and, as the engineer could not stop and shut off lights, he waited until the usual time of shutting down. On stopping the engine he found the cat alive. The wheel is 12 ft. in diam. and makes 87 r. p. m. Consequently, during two and one-half hours the cat covered a distance of about 120 miles. The cat appears none the worse for the experience." Bret Harte's white cat, that went skyward on a blast, and "riz and riz" until lost to view and friends, is no longer the final hero. Whether this Wisconsin cat really rode 120 miles, or about 93 miles, giving it the benefit of the extreme rim speed, is of no consequence at such a time as this. The public mind reposes in the fact that the cat came back to earth. Harte's cat never did.

Track Elevation for Newark.

The Newark Board of Works has decided upon an ordinance embodying the city's terms to the railroad companies as to the payment of the cost of track elevation within the city limits. The ordinance, which will be introduced in the Board Thursday, Dec. 13, will provide that the city pay $600,000 toward the cost of elevating the tracks of the Central of New Jersey and Pennsylvania railroads, and in addition pay one-half of the damages to property owners. The proposition by the companies was that the city should pay $650,000 of the cost and assume payment of all damages.

The Washington Memorial Bridge.

The House Committee on Interstate and Foreign Commerce gave a preliminary hearing, Dec. 4, upon the proposed memorial bridge across the Potomac River, connecting Arlington with Washington. Those present at the hearing were Col. Allen, Corps of Engineers, U. S. A., and Assistant Engineer Warman of his office; Prof. W. H. Burr, Mr. Andrew B. Graham, Mr. Frank Hume and Mr. James E. Clements. Col. Allen gave a brief review of the status of the memorial bridge project. In 1897 Congress provided for a survey and soundings for a bridge across the Potomac from a point near the old Naval Observatory to a convenient point on the Arlington estate. The directions of Congress were carried out and a report was made on the survey. In March, 1899, Congress appropriated $5,000 to secure plans and estimates for a bridge. The matter was then referred to a board, consisting of three army engineers and two architects, who invited plans and estimates from four distinguished bridge engineers and awarded the prize for the plan to Prof. Burr. The plan has been approved by the Chief of Engineers and Secretary of War. For a description of the plans see the *Railroad Gazette*, April 20, p. 248.

South Carolina Inter-State & West Indian Exposition.

The cornerstone of the administration building was laid on Tuesday, Dec. 11. The Exposition grounds are 250 acres of land on the Ashley River, within the city limits of Charleston. It is designed to open the Exposition on Dec. 1, 1901, and to maintain it for six months.

Improvements on the Costa Rican Railroads.

The Governor of Costa Rica has authorized the Costa Rican R. R. to issue £200,000 of preferred mortgage bonds. The proceeds are to be applied to the buying of new rolling stock, the building of the Virilla bridge, and the completion and equipment of the iron wharf now building at Limon, the equipment of all rolling stock with automatic brakes, and the replacing of ties and rails on the Guapiles branch, the building of a new station at San Jose and Limon, the improvement of the stations and warehouses of the entire line, the building and equipment of new machine shops at San Jose, the extension of the branches into new agricultural regions, and the erection of new buildings at San Jose for offices. The company is required at once to begin rebuilding the Virilla bridge, the equipment of the new rolling stock and the completion of the Limon wharf. The other improvements must be completed in five years from Aug. 24, 1900. Plans for building of branches must be approved by the Government and not less than £60,000 shall be expended on any one branch.

Concession for a Railroad in Chili.

Authority has been granted to Senor Don Ramon Rabal to build a railroad from a point called the "Rios de Curanilahue," in the department of Lebu, to a point on the Bay of Yanez, in the department of Arauco. The concessionaire has the right to use Government lands for roadbed, stations, buildings and shops and to import free from custom duties for a period of five years, merchandise not to exceed $300,000 in value for use in building and equipping the road. The plans must be approved by the President of the Republic, as must also freight and passenger tariffs, which are subject to revision every three years. The plans are to be completed within one year from the

date of the promulgation of the decree (Sept. 21, 1900), building begun within a year following the approval and completed within two years from that date.

Another decree authorizes the President of the Republic to invest $2,500,000 national currency in building at home, and in orders abroad, for the necessary equipment to operate the state railroads, which are of one meter gage and of 1.78 meters gage. It is also authorized to expend not to exceed $205,000 in acquiring materials for repairs and in the repair of the present rolling stock. The authorization is to extend for a period of 18 months. It was effective Aug. 31 last.

Firing Again.

The following is from the question box department of the Pacific Coast Railway Club: "By what methods may we obtain the most economy in locomotive firing?

"I find the most economical method of firing locomotives with the open baffler door, is by keeping the fire even over the entire grate surface, and as light as practicable; this allows the air to have free access to the fire, and aids combustion; applying a small quantity of coal at regular intervals, covering the fire very light when required, keeping the entire fire bright and of the same appearance, and as near a uniform temperature as possible. This insures proper combustion, and prevents waste of fuel by passing to the atmosphere unconsumed in black smoke; but it requires good judgment on the part of the fireman, at all times, to obtain the best results in locomotive firing. I am of the opinion that no established rule can be followed successfully, as the draft, the grate, the quality of coal, and the difference in general construction of engines must all be taken into consideration."—L. S. Ayer, Traveling Fireman.

Danger!

An alarming prospect for French railroad managers is opened up by a recent incident. At Paris, before the Eleventh Correctional Chamber (or, Police Court) the Manager of the Metropolitan Railway was summoned for contravention of the regulations regarding overcrowding of carriages. It was shown that on several occasions more passengers had been allowed in a compartment than was authorized. The Manager pleaded extraordinary pressure, his personal inability to be present at every station, and the absence of evidence of any personal negligence. His counsel further urged that instances of overcrowding were of daily occurrence on all lines, especially on those connecting the suburbs with the center of any large town, and that, whilst the law imposed a fine only for the first offense, imprisonment was the penalty for any subsequent conviction. Consequently, in a few months the managers of all the railroads in France would be in prison.

The Isle of Wight Tunnel Scheme.

The scheme for making a railroad tunnel to the Isle of Wight is being promoted under good auspices, and seems to have chances of success. The scheme is entitled the Southwestern & Isle of Wight Junction Railway, and it proposes the construction of a single line to connect the London & South-Western system at Lymington with the Isle of Wight Central Railway system near Freshwater. It is proposed to cross underneath the Solent by a tunnel about 2½ miles in length. The cost of the scheme will it is stated, not exceed £750,000.

The Suspended Bridge Again.

References have frequently been made to the new system known as "transporter bridge," or "aerial ferry," which is rapidly coming into favor in this country for the crossing of estuaries and other large expanses of water. The latest proposal of this kind is a scheme for bridging the Tyne between North and South Shields, the engineers of which are Mr. C. H. Gadsby, of Westminster, and Mr. Arnodin, the French Engineer who first introduced this method of construction, and who is at present engaged in erecting a transporter bridge at Newport (Mon.) for the Newport Corporation. The span of the Tyne bridge will be 650 ft., and its height 200 ft. It will consist of a platform suspended from a girder bridge by cables, and sufficiently large to accommodate tramcars and other vehicular traffic, as well as foot passengers. The motive power will be electricity.—*Transport.*

Commerce Through the Canals of Sault Ste. Marie, November.

The following table gives the most important items and the totals:

	U. S. Canal.	Canadian Canal.	Total.
Eastbound.			
Grain ..... bushels	4,173,688	172,824	4,346,512
Flour ..... barrels	917,370	56,775	974,145
Iron ore ..... net tons	981,164	74,301	1,055,465
Lumber ....1,000 ft. B. M.	129,177	1,727	130,904
Wheat ..... bushels	3,748,025	1,039,780	4,787,805
Westbound.			
Coal, hard.....net tons	59,754	.....	59,754
Coal, soft.....net tons	313,117	32,072	345,189
Manf'd iron.....net tons	12,783	518	13,301
Salt ..... barrels	50,612	345	50,957
Gen'l mdse.....net tons	68,521	10,155	78,676
Freight—			
East Bound.....net tons	1,543,282	131,621	1,674,903
West Bound.....net tons	461,917	42,952	504,869
Total Freight....net tons	2,005,199	174,573	2,179,772
Vessel passages... number	1,433	279	1,712
Reg'd tonnage....net tons	1,629,716	152,299	1,782,015

Rolling Stock for Austrian Railroads.

The Administration of the Emperor Ferdinand Northern Railroad has just ordered from Austrian works 31 locomotives at an average price of $15,061 per engine. The same administration, it is reported, will soon be in the market for a considerable quantity of passenger and freight cars. The gage of the road is 1.435 meters. At the end of the year 1899 the mileage was 883, and the rolling stock consisted of 506 locomotives, 1,027 passenger, and 18,172 freight cars. The address of the company is: Verwaltung der K. K. priv. Kaiser Ferdinands-Nordbahn, Vienna. Herr R. Jeitteles, 50 Nordbahnstrasse, Vienna, is the Director-General of the Company.

German Street Rails for England.

The administration of the city of Cardiff recently asked for bids for the supply of 2,000 tons of rails for the street car lines of the town. On account of the rails having to be of grooved section, for which the Cardiff mills are not prepared, the latter did not submit any offers, and the order was placed with Messrs. Dick, Kerr & Co., of Glasgow, who, in their turn, placed the order in Germany. This led to a hot fight in a recent meeting of the Cardiff councilmen. It is said that a member of the Cardiff City Administration made a statement to the effect that, if he had known that the order was to go to Germany, the municipality would not have placed the order with Dick, Kerr & Co., as a Brussels firm had submitted a quotation $1,500 below the price asked by the Glasgow firm.

Five Fast Runs.

On the 19th of November the Black Diamond Express, No. 10, of the Lehigh Valley, was run from Rochester Junction to Manchester, N. Y., 19.8 miles, in 19 minutes 42 seconds; and the last 4¾ miles of this run (from Farmington) was made in 3 minutes 10 seconds, or at the rate of 90 miles an hour; and this 4¾ miles includes a part of the Manchester yard, where speed had to be reduced. From Victor to Farmington, 4.5 miles, the grade is ascending at the rate of 21 ft. to the mile. This train consisted of engine No. 670, Atlantic type, and four cars; weight of engine, 140,950 lbs.; weight of engine and train about 292 tons. The driving wheels of the engine are 70 in. in diam. and the cylinders are 19 in. x 26 in. The timing of this train was done by three careful men.

On Dec. 6 a special train was run from Boston to New York in 4 hours 25 minutes, said to have been the fastest time ever made between these cities. The occasion was an urgent call sent to a New York lawyer, who was in Boston, to return to New York to attend an important meeting at noon. The train, two cars, left Boston at 6 a. m., and ran over the Midland and Air Line divisions to New Haven. The distance through is 214 miles, making the rate of speed 48.45 miles an hour.

A press dispatch from Chicago says that the fast mail train on the Burlington road made the run on the night of Dec. 7 from Chicago to Galesburg, 162.5 miles, in 157 minutes; the net time was 148 minutes, or an average rate of about 66 miles an hour. This is no faster than this train has run before.

The Montreal and Chicago express, known as the Eastern flyer, on the Grand Trunk, on Dec. 3, ran from Toronto to Montreal, 333 miles, in 7 hours 45 minutes, including stops. It was an unusually heavy train, six cars, and there were 20 stops; four of them consumed 14 minutes. From Brockville to Montreal, 127 miles, the time was 160 minutes, including 11 stops, averaging about 3 minutes.

On Nov. 10 a fast run was made on the Canadian Pacific by a special train carrying Lord Strathcona, between Montreal and Ottawa. For the previous 14 hours snow had been falling at intervals, and there was 6 in. of snow on the ground. The train left Montreal at 8:37 a. m., and arrived at Ottawa at 10:27 a. m.; 112 miles in 110 minutes. Deducting stops and losses by slackening the speed was 67.2 miles an hour.

Strenuousness at Wapakoneta.

At Wapakoneta, Ohio, one day last week there was an old-fashioned railroad crossing fight, with up-to-date variations, making the performance compare well with the latest innovations in indoor theatricals. The Columbus & Northwestern, a new east and west railroad, wished to lay its tracks across the Cincinnati, Hamilton & Dayton; but the latter road, not desiring any new neighbors at that point until after it should have considered the matter a little while longer, placed some freight cars on the spot where it was expected that the C. & N. would try to lay its track. The new road got a temporary injunction, enjoining interference with its work, but the C., H. & D. refused to remove its cars, even when ordered to do so by the Sheriff. By means of a wire cable the C. & N. then began to pull off the cars, one after another, and a number of them, loaded with white lead, furniture and other merchandise, were overturned in the ditch. But as fast as one car was pulled off, the C., H. & D. pushed another one along in its place, and finally a heavy switching engine was put in position; but when the other fellows attached the wire cable to this, and were about to pull, the C., H. & D. gave up; and the frogs were at once laid. Regular passenger trains were delayed several hours. It appears than 10 men who, so far as we can make out, were all connected with the C., H. & D., were arrested and lodged in jail.

LOCOMOTIVE BUILDING.

The Chicago & Eastern Illinois has ordered 11 locomotives from the Schenectady Locomotive Works.

The St. Louis Southwestern is reported to have ordered 15 engines from the Pittsburgh Locomotive & Car Works.

The Norfolk & Western has ordered 10 Class W consolidation locomotives, with piston valves, from the Richmond Locomotive Works. They will weigh, in working order, about 170,000 lbs., with 150,000 lbs. on the driving wheels, and have 21-in. x 30-in. cylinders, 56-in. driving wheels, a total wheel base of 23 ft. 11 in., and a tank capacity for 5,000 gals. of water.

The Chesapeake & Ohio has ordered 25 Class G6 consolidation locomotives from the Richmond Locomotive Works, to be exact duplicates of the 25 now building at those works for the road. The principal dimensions of the engines are: Cylinders, 22-in. x 28-in.; driving wheels, 56 in. in diam.; total wheel base, 25 ft. 3 in., and diameter of boiler, 70 in. They will weigh 184,000 lbs., with 165,000 lbs. on the driving wheels and have a tender capacity for 6,000 gals. of water.

CAR BUILDING.

The Pittsburgh Coal Co. is reported in the market for 400 coal cars.

The New York, New Haven & Hartford is asking bids on 60 passenger coaches.

The Atchison, Topeka & Santa Fe is asking bids on from 1,000 to 1,300 coal cars.

The American Car & Foundry Co. has received an order from an individual concern for 20 tank cars.

The Chicago, Indianapolis & Louisville has ordered two smoking cars from the American Car & Foundry Co.

The Northern Pacific has ordered 44 passenger coaches, two combination and two dining cars from the Pullman Company.

The Goodwin Car Co. has ordered from the American Steel Foundry Co., of St. Louis, Mo., 40 Class G Goodwin steel cars.

The Pittsburgh, Shawmut & Northern has ordered 500 coal cars of 90,000 lbs. capacity from the American Car & Foundry Co.

The Chicago, Indianapolis & Louisville is reported to have ordered four passenger coaches from the American Car & Foundry Co.

The Chicago, Rock Island & Pacific will, it is reported, build 1,000 box and stock cars, and possibly some furniture cars, in its own shops.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 200 more box cars from the American Car & Foundry Co., making 500 in all.

The Atlantic Coast Line has ordered 300 box cars for the Charleston & Western Carolina Ry., as noted Dec. 7. This order is for early delivery. The cars are to be of 60,000-lbs. capacity, will weigh 32,600 lbs., measure 34 ft. 5 in. long inside, 8 ft. 10 in. wide inside, and 6 ft. 10 in. high inside, and be equipped with Sterlingworth brake-beams, Westinghouse brakes, Ajax brasses, Tower couplers, Dayton door fastenings, Butler draft riggings, Pressed steel journal box lids and French springs.

BRIDGE BUILDING.

Allegheny, Pa.—The city has reached an agreement with the Pittsburgh, Fort Wayne & Chicago in regard to grade crossings. At the Marion avenue crossing it is decided that the tracks be elevated 6½ ft. and the street be depressed 7 ft. Plans are adopted for a viaduct at the Washington and Sedgwick avenue crossing which involve lowering the railroad tracks 6 ft., giving a clearance of the bridge above the tracks 16¼ ft. The bridge is to be built and maintained by the railroad and is to have a total width of 54 ft., a driveway of 42 ft., and sidewalks on each side of 6 ft. each. A committee, consisting of J. M. Goehring, W. F. Trimble and J. McNaugher and the City Solicitor and Director of Public Works, will confer with the railroad officials regarding the beginning of the work.

Allentown, Pa.—The Mayor has approved the ordinance for a bridge from Eighth street, at Union, to Salisbury across Little Lehigh River. The detailed plans will be ready in about two weeks. The bridge will be built by the Allentown & South Allentown Bridge Co., of which R. S. Rathbun, former City Engineer, is Chief Engineer and Fred E. Lewis is President. The bridge will be about 1,750 ft. long with 2,200 ft. of approach. Estimated cost, $200,000. Bids will soon be wanted.

Berlin, N. H.—The suspension bridge of the Burgess Sulphite Fiber Co., across the falls of the Androscoggin River, collapsed Dec. 5.

Burnside, Conn.—A committee is considering the matter of rebuilding the bridge over the Hockanum River, in Burnside, with either a steel or stone structure.

Cairo, Ill.—The Southern Illinois & Missouri Bridge Co. has been incorporated to build a bridge over the Mississippi River at Cairo. It will cost between $1,500,000 and $2,000,000, and will be used by the Chicago & Eastern Illinois, the Illinois Central and other roads which now use the ferries. The incorporators named are Myron J. Carpenter, Charles W. Hillad and Oliver S. Lyford, all of Chicago.

Cohoes, N. Y.—The city is acquiring property preparatory to building the overhead bridge at Ontario street. The bridge will probably consist of three spans, one of 54 ft. and two of 40 ft.

Work is progressing to eliminate the grade crossing at High street, but no bridges will be built until next year.

Columbus, Kan.—Contract will be let, Dec. 27, for two 125-ft. spans on tubular piers 37½ ft. high; 16 ft. roadway. Bidders to furnish plans and specifications; also alternate bids on two spans each 140 ft. long as above specified. S. W. Sweeney, County Clerk, Cherokee County, Columbus, Kan.

Corapolis, Pa.—The plans for the 800-ft. bridge proposed over the Ohio River by the Corapolis & Sewickley Bridge Co., are reported approved by the United States Engineer Officer in charge of the Ohio River. The bridge will cross from Lashell's Landing to Sewickley, and will cost about $250,000. The company was incorporated about a year ago. A. P. Kirkland is President.

Des Moines, Iowa.—The Chicago, Rock Island & Pacific has let a contract to the American Bridge Co. to rebuild the bridge at Market street, Des Moines, which will require about 3,500 tons of steel, placed on the present foundations.

Dubuque, Iowa.—A bill has been introduced in the United States Senate amending the act of last March for a bridge across the Mississippi River at Dubuque. The amendment reduces the width of the draw from 200 ft. to 175 ft. The Dubuque & Wisconsin Bridge Co. will build this bridge, which, as projected, will be 1,470 ft. long. Estimated cost, $135,000. (Oct. 19, p. 694.)

Lansing, Mich.—The City Engineer is reported making plans for a bridge on Washington avenue, South.

Lockesburg, Ark.—The contract for a steel bridge across the Cossatot River in Sevier County, Ark., will be let by public outcry on Dec. 29, at 12 o'clock noon, at the door of the courthouse in Lockesburg. The bridge will consist of one steel span 149 ft. long and 14 ft. roadway with wooden approaches 14 ft. long at each end. Span to rest on steel tubular piers 36 in. diam. and 33 ft. long. The bridge is to cross the Cossatot River about four miles west of Lockesburg, eight miles east of Horatio, and be finished within six months from date of contract. G. A. Vaughan, W. W. Millwee, Geo. A. Bell, Lockesburg, Ark., Commissioners.

London, England.—Reports state that a company has been formed in London, Eng., with a capital of £130,000, to build a suspension bridge over the Tyne at the harbor mouth between North and South Shields. The undertaking has the support of the corporations of Tynemouth and South Shields. The engineers are Mr. C. H. Gadsby, Consulting Engineer, Westminster, and M. Amodin, of Paris, France.

Merrill, Wis.—A resolution has been adopted by the City Council for a bridge over the Wisconsin River at Genesee street.

A bridge is also contemplated at Third street over Prairie River, a branch of the Wisconsin.

Mt. Carmel, Pa.—The Dean & Westbrook Co., 136 Liberty street, New York, has a contract for a steel trestle 35 ft. high for the Shamokin & Mt. Carmel Electric Ry., requiring about 300 tons of steel. R. A. Simmons, of Pottsville, Pa., has the contract for erection.

New Westminster, B. C.—Regarding the report in this column, Nov. 16, that the Dominion Government would build a bridge at this place, we are officially informed that the Dominion Government does not intend bridging the Fraser at this point. There is a possibility of the Provincial Government building a through line from the coast into Kootenay, which will necessitate bridging the Fraser at this point. There has been, however, no definite announcement made respecting the matter, nor is there likely to be until Parliament meets.

There is also talk of the Great Northern Ry. bridging the Fraser at this point.

NEW YORK, N. Y.—The American Bridge Co. has the contract for the large drawbridge over the Harlem River at 145th street. It consists of two approach spans 120 ft. each, and a draw span of 380 ft. It is 80 ft. wide with paved roadway, and will require about 3,000 tons of material. A contract was let in December, 1897, to Messrs. O'Brien, Sheehan & McBean, of New York, but, owing to the lack of funds, work was not begun. The plans were amended by the Department of Bridges, and the appropriation increased to $1,750,000. (April 20, p. 261.)

NILES, MICH.—We are told there is no truth in the report that the "Big Four" will build a bridge near Niles. The city has a bridge in contemplation.

PHILADELPHIA, PA.—The City Council, on Dec. 6, passed a bill authorizing bridges built at the following places:

Thirty-third street, over Connecting Railway and Reading Railway, $125,000.
Frankford Creek, on line of Frankford avenue and on line of Old Front street, including change in course of the creek, $100,000.
Allegheny avenue, under the North Pennsylvania Railroad, $40,000; city's share, half of the cost.
Luzerne street, under North Pennsylvania Railroad, to abolish Rising Sun Lane grade crossing, $91,000.
Lehigh avenue, under the Connecting Railroad, $74,000.
Gibson avenue, over the Baltimore & Philadelphia Railroad, $30,000; cost divided between city and railroad.
Fifty-seventh street, over West Chester & Philadelphia Railroad, $28,000.
Seventy-first street, over Philadelphia, Wilmington & Baltimore Railroad, $17,000.
Oak Lane, over North Pennsylvania Railroad, $10,000; city's share, half.
High street, Chew street and Washington lane, under the Chestnut Hill Railroad, $70,000.
Olney avenue, under the Tabor branch of the Philadelphia & Reading Railway and the North Pennsylvania Railroad, $50,000; city's share, half.
Dauphin street, under the Connecting Railway, $40,000.
Passyunk avenue, across the Schuylkill, $75,000 to begin the work.

PINE BLUFF, ARK.—The city is reported considering plans and estimates for a bridge proposed over the Arkansas.

PITTSBURGH, PA.—The Nelson & Buchanan Co. recently submitted the lowest bid for a bridge 40 ft. wide to replace the old South Tenth street bridge. It is reported that the plans will be changed for a bridge 60 ft. wide, the extra expense to be paid by the Pittsburgh & Birmingham Traction Co. (Nov. 23, p. 782.)

SCRANTON, MISS.—The County Board of Supervisors has authorized a steel bridge built over Big Creek in the northern part of Jackson county.

SEABRIGHT, N. J.—The contract for the steel drawbridge over the South Shrewsbury River is let to the American Bridge Co., at $64,697. Nine bids were received, as follows: Variety Iron Works, $65,250; Bracket Bridge Co. (Cincinnati, Ohio), $67,000; J. E. Buddington, $65,900; Stacy B. Opayke, Jr., $65,100; American Bridge Co., $64,697; F. R. Long Co., $64,980; Dean & Westbrook, $64,950; Sanford & Stillwell Co., $64,795; Illinois Bridge Co., $65,200.

SYRACUSE, N. Y.—We are informed that the grade crossing in the town of Geddes will be eliminated next year.

TAZEWELL, TENN.—The County Court will meet early next month to consider bridging Powel's River with a steel structure of two spans.

TOLEDO, OHIO.—The County is reported considering issuing $30,000 bonds for new bridges.

TORONTO, ONT.—The Toronto Railway will build a new bridge over the Grand Trunk Ry., according to report, for a proposed extension.

VANCOUVER, WASH.—The Washington & Oregon R. R. (see Railroad Construction) will bridge the Columbia River at Vancouver.

WASHBURN, ME.—Regarding the report that the Bangor & Aroostook R. R. will bridge the Aroostook River at this place, we are officially informed that the railroad has no bridge work under contemplation, but the town is considering building a three-span lattice bridge of 480 ft., each span being 160 ft. Nothing definite is decided.

WASHINGTON, D. C.—Representative Allen, of Maine, introduced a bill, Dec. 7, to appropriate $50,000 for an aubutment for a bridge across the south channel of the Adancostia River.

WATERTOWN, N. Y.—The details for the Arsenal street bridge over the railroad tracks, are in the hands of the City Engineer. Estimated cost, $33,000.

WATERTOWN, WIS.—Bids are wanted, Dec. 15, by the Board of Public Works, for a steel bridge 167 ft. long, of three spans, over Rock River at Cady street. G. H. Stanchfield, City Engineer.

WEBSTER, MASS.—Plans are being made by W. O. Rugg, Worcester, Mass., according to report, for the abolition of the grade crossing at Main street.

Other Structures.

ALBUQUERQUE, N. MEX.—The Atchison, Topeka & Santa Fe has let a contract to Anson & Holman, of La Grange, Ill., to build a hotel and depot in Albuquerque, after the plans made by Chas. F. Whittlesey, 90 La Salle street, Chicago, Ill. The hotel will be 150 ft. wide and 190 ft. long, two stories high with a tower. An annex will be 41 x 106 ft. The depot will be 60 ft. wide and 150 ft. long, with an arcade, 200 ft., connecting the hotel and depot, and kiosk, 110 ft.

ALLEGHENY, PA.—J. N. Parsons, Geo. Shaffer, E. G. Schillo and others, will make application for the incorporation, in Pennsylvania, of the Eagle Tool & Machine Co., to make iron and steel and articles from metal. W. R. Murphy, 405 Grant street, Pittsburgh, is Solicitor for the applicants.

BIRMINGHAM, ALA.—The Dimmick Pipe Works, recently erected in North Birmingham, will issue $100,000 of first mortgage bonds to enlarge the plant.

BUFFALO, N. Y.—The Great Eastern Elevator Co. has given a mortgage to the Fidelity Trust & Guaranty Co. for $350,000 to rebuild the elevator destroyed by fire some months ago.
The Brown Car Wheel Works will build an addition to increase the capacity of the plant. Howard G. Brown, Manager.

HALIFAX, N. S.—Between $58,000 and $62,000 will be spent, according to report, by a company represented by E. P. Allison, of Halifax, Nova Scotia, for a cold storage and ice-making plant, if the authorities in that city grant the permission to build.

NEW YORK, N. Y.—Six new station buildings will be erected between White Plains and Mount Kisco on the Harlem Division of the N. Y. C. & H. R. R. R., which will be double-tracked from White Plains.

NILES, OHIO.—At a meeting of the recently organized Niles Iron & Steel Co., on Dec. 4, James Patterson was elected President, H. M. Robinson, Vice-President; W. A. Thomas, Secretary and Treasurer. (Nov. 30, p. 800.)

PITTSBURGH, PA.—Plans have been made for remodeling and enlarging the Clinton furnace of the Clinton Iron & Steel Co., on the Southside, at a cost of $75,000. Walter Kennedy, of Pittsburgh, is the engineer in charge. The furnace now has one stack 73 ft. high and 16½ ft. wide at the bosh. Its daily capacity is 250 tons. The new stack will be 85 ft. high and 20 ft. wide at the bosh. The capacity will be more than 350 tons daily. The four furnace stoves will be rebuilt. It is expected that the contracts will be let next month.

WASHINGTON, D. C.—Proposals will be received at 12 o'clock, Jan. 2, at the office of the Attorney-General of the United States, for all the work for the new building for the Department of Justice, to be built in Washington. Drawings, etc., may be seen at the office of the Attorney-General, Washington, D. C., and at the office of the Architect, George B. Post, 33 East 17th street, New York, between the dates of Dec. 7 and Dec. 31. John W. Griggs, Attorney-General.

WESTWEGO, LA.—Bids will probably be wanted in 30 days, according to report, by the Texas & Pacific for the 1,000,000-bu. grain elevator at Westwego, opposite New Orleans.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xi.)

Canadian Society of Civil Engineers.

At the meeting, on Thursday, Dec. 6, at 877 Dorchester street, Montreal, an abstract on "Structural Paints" was presented and discussed.

The Engineers' Club of Philadelphia.

In place of the stated meeting of the Club, on Dec. 15, the anniversary of the founding of the Club, will be held at the New Century Drawing Room, on the evening of that day. The affair will be quite informal. The President will make an address on "A Brief History of the Club." An illustrated lecture on "Popular Features of the Paris Exposition" will be delivered by Mr. Carl Hering.

M. M. and M. C. B. Conventions.

The 1901 conventions of the American Railway Master Mechanics' and Master Car Builders' Associations will be held at Saratoga Springs, N. Y., the former beginning Wednesday, June 19, and the latter, Monday, June 24. The headquarters will be at the Grand Union Hotel. It will be recalled that last year, as an experiment, the meetings of both associations were held in one week, and heretofore the Master Car Builders have held their sessions first.

Western Railway Club.

A meeting of the Western Railway Club will be held Tuesday afternoon, Dec. 18, at the Auditorium Hotel, Chicago. The following papers will be read and discussed: "Box or raised patches and the best way to apply them to fire-boxes," by Mr. W. H. Graves, foreman of the Burlington & Missouri River Railroad; "Suggestions as to Fuel Economy," by Mr. Ira C. Hubbell; and "A New Wheel Contour," by Mr. S. P. Bush, Superintendent of Motive Power, Chicago, Milwaukee & St. Paul.

St. Louis Railway Club.

A regular meeting of the St. Louis Railway Club will be held at 3 p. m., Friday, Dec. 14, in the Southern Hotel parlors, St. Louis, on which occasion Mr. Morris Wuerpel, Jr., Signal Engineer, Terminal Railroad Association, will present a paper describing the method of signaling trains through the St. Louis tunnel, illustrating same with a stereopticon.
The program for the annual meeting of the St. Louis Railway Club, Dec. 14, provided for a stereopticon lecture on the Paris Exposition, at the Odeon theater, by Mr. J. R. Williams, of the American Brake Co.; the lecture being in the evening.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. W. N. Jackson, Secretary of the Indianapolis Union road, died at Indianapolis, Dec. 9 at the age of 91.

—Mr. George De Haven is now Excursion Manager of the Baltimore & Ohio, with office at Baltimore. Mr. De Haven was for several years Assistant General Passenger Agent of the New York, Lake Erie & Western, and since 1891 has been General Passenger Agent of the Chicago & West Michigan and the Detroit, Lansing & Northern.

—Mr. James Roosevelt, Vice-President of the Delaware & Hudson, died Dec. 8. Mr. Roosevelt was born at Hyde Park, N. Y., July 16, 1828, and was appointed State Commissioner from New York to the World's Fair at Chicago. He was a director of the Delaware & Hudson and the Farmers' Loan & Trust Company, also a director and Chairman of the Executive Committee of the Maritime Canal Company of Nicaragua.

—Mr. George W. Edwards has resigned as General Superintendent of the elevated and bridge divisions of the Brooklyn Rapid Transit Co. Mr. Edwards has been identified with the operating department of the elevated railroads of Brooklyn for about fifteen years past. He was Master of Transportation of the old Brooklyn Elevated Railroad until early in 1892, when he was appointed Assistant Superintendent by Mr. O. F. Nichols, then General Manager and Chief Engineer. In 1894 he was made Superintendent and filled that place until his appointment to the position he has just left, having been retained by the Brooklyn Rapid Transit Co. when the Brooklyn Union Elevated became a part of that system. (April 30, 1899.)

—Mr. George W. Vaughan, the new Division Engineer on the Pennsylvania Division of the New York Central & Hudson River, was born at Paucatuck, Conn., in 1859. His first professional training was obtained at Warren's Polytechnic College, Providence, R. I. After spending a few months in the Potter Printing Press Works, of Plainfield, N. J., he began railroad service in February, 1881, as rodman on the Pittsburgh, Cincinnati & St. Louis. He continued with the same company until April, 1887, as Assistant to the Engineer of Maintenance of Way from April, 1883; as Supervisor of Track of the Third Sub-Division from April, 1884, and as Assistant to the Engineer of Maintenance of Way from March, 1887. He then became Assistant to the Division Engineer of the Eastern Division of the New York, Chicago & St. Louis, in the service of which company and its parent company, the New York Central, he has since continued. He was Division Engineer of the Eastern Division from February, 1889, and Engineer of Maintenance of Way from March, 1894, to August, 1898, when he became Engineer in charge of all surveys, bridges, buildings, etc. In December, 1899, he became Supervisor of Bridges and Buildings of the Eastern Division of the New York Central, in which position he continued until this present month, when he was made Division Engineer of the Pennsylvania Division.

ELECTIONS AND APPOINTMENTS.

Alliance & Northern.—C. O. Scranton, Car Accountant, has been appointed Acting General Freight Agent also.

Arkansas Southern.—R. W. Huie has been appointed General Auditor, with headquarters at Arkadelphia, Ark.

Baltimore & Ohio Southwestern (Baltimore & Ohio).—James McCrea (First Vice-President of the Pennsylvania Company) has been elected a Director of the B. & O. S. W.

Brooklyn Rapid Transit.—George W. Edwards, General Superintendent, has resigned.

Canadian Pacific.—A. Cameron, Assistant General Freight Agent on the Pacific Division at Vancouver, B. C., has resigned.

Chesapeake & Ohio.—At a meeting of the stockholders, held Dec. 11, S. R. Callaway (President of the New York Central & Hudson River), was elected a Director, succeeding the late Horace J. Hayden. W. J. Thomas has been appointed Master Mechanic of the Louisville Terminals.

Cincinnati Northern.—F. W. Whitridge has been elected President, with headquarters at 44 Pine street, New York City.

Columbus, Lima & Northwestern (Columbus & Northwestern.)—W. M. Segar has been appointed Superintendent.

Cowen & Greenbrier.—The officers of this company, referred to in the Construction column, are: President, James H. McCreery, Pittsburgh, Pa.; Vice-President, Colonel Hugh Sterling, Wheeling, W. Va.; Secretary and Treasurer, F. C. Kohue, Pittsburgh; Superintendent and Chief Engineer, A. C. Hays, Pittsburgh.

Dayton & Troy Electric.—The officers of this company, referred to in the Construction columns, are: President, Valentine Winters; Vice-President and General Manager, Harrie P. Clegg; Secretary, Charles B. Clegg; Treasurer, J. H. Winters; Engineers, Messrs. Sargent & Lundy, Chicago.

Delaware, Lackawanna & Western.—Edwin M. Rine, heretofore Acting Superintendent of the Scranton Division, has been appointed Superintendent of the same division.

Grand Trunk.—G. B. Reeve, the new General Manager, has been appointed Second Vice-President also.

Green Bay & Western.—W. C. Modisett has been appointed General Freight and Passenger Agent, with headquarters at Green Bay, Wis., succeeding J. B. Last, resigned.

Gulf & Ship Island.—E. M. Lake, heretofore Master Mechanic, has been appointed General Master Mechanic and W. F. Post Division Master Mechanic, with headquarters at Saratoga, Miss.

Gulf, Beaumont & Kansas City (Atchison, Topeka & Santa Fe).—E. P. Ripley has been elected President.

Kansas City, Fort Scott & Memphis.—H. M. Fickinger has been appointed Superintendent of the Eastern Division at Memphis, Tenn., succeeding J. H. Sullivan, resigned.

Louisville & Nashville.—J. E. Monahan has been appointed Division Master Mechanic, with headquarters at Paris, Tenn.

Ohio & Little Kanawha.—J. N. Wilson has been appointed Auditor, succeeding A. P. Deeds, resigned.

Pennsylvania.—A. W. Moss has been appointed Division Superintendent, with headquarters at Allegheny, Pa., succeeding D. M. Watt. F. F. Robb succeeds Mr. Moss as Division Superintendent at Reading, Pa. A. C. Shand, heretofore Principal Assistant Engineer, succeeds A. E. Reed, deceased, at Altoona, Pa., as Division Superintendent and in turn is succeeded by E. J. Cleave.

Richland & Mahoning.—The officers of this company are: President, C. W. French; Vice-President and General Manager, C. D. Crouch; Secretary, Huntington Brown; General Counsel, C. E. McBride, and Chief Engineer, E. C. Hurd. The Directors, including the above-mentioned except Mr. Hurd, are: L. E. Cochran, J. Whiting, Jr., H. B. Stewart, J. C. Corns, C. A. Gates, M. L. Smyser, W. W. Woodward and H. C. Hedges. (See R. R. Construction Supplement, July 27, 1900.)

Rio Grande Southern.—A. S. Meldrum, heretofore Trainmaster, has been appointed Acting Superintendent.

St. Louis & Hannibal.—H. M. Modisett, heretofore General Agent, has been appointed Assistant Superintendent, succeeding W. C. Modisett, resigned.

Santa Fe, Prescott & Phoenix.—R. E. Wells, Assistant General Manager, having resigned, that position is abolished. W. A. Drake, Chief Engineer, has been appointed General Superintendent also.

Seaboard Air Line.—R. H. Tate has been appointed Assistant General Passenger Agent, with headquarters at Atlanta, Ga. M. O'Connor has been appointed Acting Southwestern Freight and Passenger Agent, with headquarters at New Orleans, La., succeeding R. H. Tate.

Southern.—The headquarters of J. R. Pill, P. S. Fitzgerald and F. M. Edwards, Assistant Engineers at

Birmingham, Ala., Knoxville, Tenn., and Atlanta, Ga., respectively, have been removed to Chattanooga, Tenn.

Virginia & Southwestern.—William Coyne, heretofore Trainmaster, has been appointed Superintendent, with headquarters at Bristol, Tenn.

Wabash.—E. F. Needham has been appointed Assistant Division Master Mechanic, with headquarters at Decatur, Ill., succeeding F. H. Paine, resigned.

Warren & Corsicana Pacific.—James Wilson, General Superintendent at Warren, Tex., has resigned.

Wheeling & Lake Erie.—F. C. Gates, Purchasing Agent at Cleveland, Ohio, has resigned, effective Jan. 1.

Wisconsin & Michigan.—The officers of this company are: President, C. H. Bosworth; Vice-President, J. C. Ames; General Freight and Passenger Agent, J. C. Fitzgerald; Secretary and Auditor, O. A. Koss; Treasurer, B. Shaw. All with headquarters at Chicago, Ill. Chief Engineer, B. C. Gowen; Superintendent of Transportation, T. E. Corrigan, and Master Mechanic, W. T. Fitzgerald, with headquarters at Peshtigo, Wis.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Albuquerque & Santa Fe.—This company was incorporated in Colorado, Dec. 8, to build a railroad from Santa Fe, N. Mex., southwest about 150 miles to Albuquerque, connecting with the Denver & Rio Grande at San Pedro. A branch is also projected to the proposed extension of the Chicago, Rock Island & Pacific. The two companies are reported back of the project.

Baltimore & Ohio.—An officer writes that nothing is known as to surveys between Canton, Ohio, and East Liverpool, for a shorter line to Chicago, as reported. (Nov. 30, p. 801.)

Brighton, Warkworth & Havelock Electric.—Bonuses are being asked along the route for this proposed electric line from Brighton Harbor, Ont., on the Grand Trunk, to run northwest about 25 miles via Hilton, Orland, Codrington, Norham, Warkworth, Meyersburg, Campbellford and Heeley Falls to Havelock on the Canadian Pacific. The line is to run over private right of way, and is to be laid with heavy steel. Among those interested are Messrs. Hardin & Barber, of Brighton.

Canadian Pacific.—Building is to be begun in the early spring, according to reoprt, on a line across Ottawa, connecting the main and short lines.

Mr. J. E. McMullen, on behalf of representatives of the C. P. R., will apply to the Dominion Parliament at its next session to incorporate the Kootenay & Arrowhead, to build along the route described above.

Surveyors are reported locating the line from Trout Lake, B. C., northwest to Arrowhead. (Construction Supplement, July 27, 1900.)

Chambersburg & Gettysburg Electric.—This company was incorporated in Pennsylvania, Dec. 6, with a capital stock of $50,000, to build a railroad seven miles long from Chambersburg to Fayetteville. John P. Miller, of Carlisle, Pa., is President. The Directors are: J. M. Runk, of Chambersburg; J. Marshall Young, T. M. Lesher and D. McNevin, all of Easton.

Chicago, Rock Island & Mexico.—This company was incorporated in Texas, Dec. 7, to build the proposed extension of the Chicago, Rock Island & Pacific from Liberal, Kan., southwest about 250 miles to White Oaks, N. Mex., to connect with the El Paso & Northeastern, which is said to be controlled by the C., R. I. & P. (Construction Supplement, July 27, 1900.)

Chicago Short Line.—This company was incorporated in Illinois, Dec. 10, to build a railroad from the east side of the Calumet River at Ninety-fifth street, Chicago, to run south and southeast, connecting the Baltimore & Ohio, and the Chicago Terminal Transfer, and thence east to the border of Cook County.

Choctaw, Oklahoma & Gulf.—A number of surveys are in progress on the proposed extension from Weatherford, Okla. T., west toward Amarillo. (Nov. 2, p. 732.)

Connecticut Roads.—Application is to be made to the State Legislature for permission to build the connecting links for an electric line from Hartford along the east side of the Connecticut River to Springfield, Mass.

Cowen & Greenbrier.—This line is located and is being cross-sectioned to run from Cowen, W. Va., east to the Greenbrier Valley. Contracts will be let about Jan. 1. (Dec. 7, p. 817.) The officers are given under Elections and Appointments. (Official.)

Dayton & Troy Electric.—Grading is practically finished and track laying will be begun about Jan. 1 on this electric line from Dayton, Ohio, north about 19 miles via Chambersburg, Vandalia, Ginghamsburg and Tippecanoe City to Troy. There has been some difficult work in grading, but no grades exceed 3 per cent. Contracts have been let for the machinery as follows: Westinghouse Electric & Manufacturing Co., for two 400-k.w. generators, one 200-k.w. motor-driven booster and switchboard, ten equipments, four 75-h.p. motors geared 40 miles an hour; Buckeye Engine Co., Salem, Ohio, for two 625-h.p. cross-compound condensing engines; Aultman-Taylor Manufacturing Co., Mansfield, Ohio, for four 300-h.p. boilers, B. & W. type; Stilwell-Bierce & Smith-Vaile Co., Dayton, Ohio, for pumps and heaters; Carnegie Steel Co., for 300 tons of 70-lb. rail, 60-ft. length; New Castle Bridge Co., New Castle, Ind., for eight bridges; Barney & Smith Car Co., of Dayton, Ohio, for ten cars, 49 ft. long and 8 ft. 5 in. wide. (Nov. 30, p. 801.) The officers are given under Elections and Appointments. (Official.)

Delaware, Lackawanna & Western.—An officer writes that preliminary surveys are in progress for the cut-off in Western New Jersey from Waterloo west to Delaware Gap, but nothing definite is determined in regard to the same, nor will there probably for some time. Other surveys are in progress along the line to examine what changes may be practicable in the near future.

Easton, Tatamy & Bangor Street.—This company was incorporated in New Jersey, Dec. 6, with a capital stock of $60,000, to build a railroad 10 miles long connecting the cities named in the title. Cotton Amy, of East Bangor, is President. The directors are: Harry H. Haines, Thomas A. H. Hay and C. L. Hemingway, of Easton; M. P. McGrath, of Worcester, Mass.; John W. Jones, W. R. Grubb, Milton, and Flory and D. Huddleson, of Bangor.

Great Northern.—The property owners of Victoria, B. C., have decided to give a bonus of $15,000 a year for 20 years to a company which will build the railroad and operate a ferry to the mainland, as proposed by the Great Northern. (Nov. 30, p. 802.)

Jeffersonville, New Albany & Sellersburg Rapid Transit.—The electric road referred to last week (p. 818) under Indiana roads, is projected under the above title. Louis Schneck, of Seymour, Ind., and Lennard Kranz, of Seilersburg, have made application to the Clark County Commissioners for a franchise for a line to run from Speeds south via Sellersburg to Hamburg, and thence along the New Albany & Charleston highway to New Albany. From New Albany the line is to run east via Howards Park and Clarksville to Jeffersonville, directly across from Louisville, Ky. The line is to run from Jeffersonville north through Claysburg and along the Jeffersonville & Hamburg turnpike, intersecting the main line at Hamburg, making a total of 20 miles. This route forms a triangle at the southern end, with New Albany and Jeffersonville as the angles of the base. The company is not yet fully organized and no surveys are made. (Official.)

Kansas & Southern.—Final surveys are reported completed for the extension from Westmoreland, Kan., south about 35 miles through Myers Valley, Louisville and Wamego to Alma. It is stated that contracts will be let this winter. (Construction Supplement, July 27, 1900.)

Little Miami Traction.—This company was incorporated in Ohio, Nov. 30, with a capital stock of $50,000, to build an electric line from Springfield southwest about 75 miles via Xenia, Wilmington, Lebanon, Dayton, Middletown and Loveland to Cincinnati. The incorporators are: Charles J. Christy and W. E. Hutton, Cincinnati; John P. Martin and Warren D. Riddell, Xenia; Charles Orr, Rufus P. Ranney and R. L. Andrews, Cleveland.

Louisiana Roads.—Mr. F. F. Myles, of the Myles Salt Co., Ltd., New Orleans, La., writes that he proposes to build an electric line from New Iberia to run southeast about 45 miles, paralleling the Southern Pacific and along the Bayou Teche, through Jeanerette, Baldwin, Franklin and Pattersonville, to Berwick City, there connecting by ferry with Morgan City. The population along the line is estimated at 60,000.

Louisville & Nashville.—Steps are being taken, according to report, for building a line connecting the Tuscumbia branch with the main line a few miles below Columbia, Tenn., to run from Mt. Pleasant east via Southport to Campbell.

Mexican Central.—Final surveys are completed from Gutierrez, Mex., to run northwest 106 km. (66 miles) to Sombrerete, in the State of Zacatecas, to connect an important mining district. (Nov. 23, p. 784.) No arrangements are made for building the line and it will undoubtedly not be undertaken in the immediate future. (Official.)

Miscellaneous Companies.—The Arctic Construction Co. was incorporated in Washington, Dec. 5, with a capital stock of $50,000, to build railroads, etc. The incorporators are: H. S. Peterson and W. L. Green, Skaguay, Alaska; A. B. Mitler, Seattle.

Missouri, Kansas & Texas.—Building is begun, according to report, on the extension of the Colegate branch from Colegate, Ind. T., northwest about 110 miles to Oklahoma City. It is stated that 14 contracts are let.

An officer writes that the proposed second track between McAlester and South McAlester, Ind. T., consists simply in connecting some sidings already laid, and there is not more than a mile of new track contemplated. (Nov. 23, p. 784.)

Montana.—An officer writes that there is no definite plan at present for building the extension via White Sulphur Springs, Mont., to the Copperopolis mines. Only a preliminary survey is made and the developments at the mines are not yet sufficient to warrant the building. (Dec. 7, p. 818.)

Nashville, Chattanooga & St. Louis.—Building is already begun on the branch from Dunlap, Tenn., to new coal mines. It is to be 4,000 ft. long, with 2 per cent. maximum grades and 8 deg. maximum curves. (Nov. 30, p. 802.) It is to be laid with 58-lb. second-hand rails. (Official.)

New York Central & Hudson River.—Building is begun on the double-tracking of the Harlem Division between White Plains and Mount Kisco, above New York City. (Nov. 16, p. 764.)

North Carolina Roads.—The Beaufort County Lumber Co., of Greenville, is building a lumber road from Greenville southeast about 25 miles to Vanceboro, with Newbern as presumably the ultimate terminus. It is stated that 10 miles of track is laid.

Port Arthur, Houston & Western.—Surveys are reported to be begun at once on this line from Port Arthur, Tex., west about 80 miles to Houston. Wm. McDaniel, of Port Arthur, Tex., is President. (Oct. 19, p. 696.)

St. Louis & San Francisco.—An officer writes that there is nothing in the $2,500,000 contract with Lantry Bros., widely reported, for extensive improvements.

Seattle & Tacoma Short Line.—This company has been incorporated in Washington with a capital stock of $1,000,000, to build a railroad connecting the two points, about 30 miles. The incorporators are: F. E. Sander, W. P. Trimble and M. D. Haynes, all of Seattle.

Southern Pacific.—The Natron, Ore., branch is to be extended, according to report, from eight to ten miles to sawmills.

Toronto & Central Ontario.—The Committee on Works and Legislation and Reception of the City of Toronto has approved a bill to incorporate this company to build at least six electric radial railroads extending east, north and west from the City of Toronto, comprising about 100 miles. The city will assist to obtain a special act of the Legislature. Alderman Daniel Lamb, Chairman of the Committee on Works, is interested.

Toronto Railway.—This company proposes to extend its electric line from its present terminus at the corner of Girard and Main streets, East Toronto, on east to the village of Little York, in the early spring. It will require a new steel bridge over the Grand Trunk.

Washington & Oregon.—This company was incorporated in Washington, Dec. 4, to build a railroad from Portland, Ore., north to Tacoma and Seattle, bridging the Columbia at Vancouver. Allen G. Mason, of Tacoma, is among the incorporators.

Western Maryland.—An officer writes that there is no foundation for the newspaper reports that the company is making surveys for an extension to coal fields in Pennsylvania. If there are engineers in the field, as reported, it is without the knowledge of the company.

The reported double-tracking of the Potomac Valley line is also without foundation. (Dec. 7, p. 818.)

Youngstown-Sharon Railway & Light.—This company was incorporated in New Jersey, Dec. 5, with a capital stock of $2,500,000, to take over all the electric railroads in Youngstown, Ohio, and Sharon, Pa., and to build a connecting line between the two cities, about 15 miles.

GENERAL RAILROAD NEWS.

Baltimore & Ohio Southwestern.—At the annual meeting of the stockholders, held at Cincinnati, Ohio, Dec. 10, the lease of the property to the Baltimore & Ohio was ratified. The general offices will remain at Cincinnati. (Feb. 9, p. 96.)

Boston & Albany.—The directors, on Dec. 11, declared a dividend of $2.25 per share, an increase of 25 cents over the previous rate. This increase represents a portion of the interest from the $5,500,000 New York Central 3½ per cent. bonds received under the lease. The annual revenue from these securities is $192,500, or about 77 cents per share, and it has been decided to pay this sum in two annual payments, one of 25 cents on Dec. 31, and the other of 50 cents on June 30.

The directors voted to ask the State Railroad Commissioners for authority to issue $2,500,000 of 3½ per cent. 50-year bonds, the proceeds to be used in carrying out extensive improvements in East Boston, as proposed under the lease. (Oct. 5, p. 662.)

Chicago & Eastern Illinois.—Two Indiana Block Coal bonds for $1,000 each, and three for $500 each, have been drawn for payment at the Farmers' Loan & Trust Co., New York, interest to cease Jan. 1. (Jan. 5, p. 14.)

Chicago, Burlington & Quincy.—Sixty-nine 5 per cent. and 160 4 per cent. Iowa Division bonds, dated Oct. 1, 1879, for $1,000 each, have been drawn for payment at the company's office, Boston, or the National Bank of Commerce, New York, April 1, 1901, at 105 and accrued interest for the 5s, and at par and interest for the 4s, interest to cease after April 1. (Oct. 12, p. 680.)

Cincinnati, Hamilton & Dayton.—The stockholders at a special meeting at Cincinnati, Ohio, Dec. 11, decided to refund the bonds of the company into new 4 per cents, the maximum issue being $25,000,000. The details are to be left to the Board of Directors. (Nov. 16, p. 764.)

Denver & Rio Grande.—On Dec. 6 the company declared a semi-annual dividend of 2½ per cent. on its preferred stock, payable Jan. 15. The dividend of July last was 2 per cent. The surplus for the six months ending Dec. 31 is estimated at $950,000, or equal to 4 per cent. on the preferred stock. (Nov. 2, p. 732.)

Detroit & Mackinac.—J. F. Lisman & Co., New York, offer $100,000 mortgage gold 4 per cent. bonds, due 1995, at 88 and interest.

Duluth & Iron Range.—Jacob Rubino, of New York, offers $200,000 first mortgage 5 per cent. bonds at 109 and interest.

Fonda, Johnstown & Gloversville.—The company recently offered $200,000 of 4 per cent. general refunding gold bonds, due July, 1950. It is stated that no more are to be offered prior to Oct. 1, 1901. The total authorized is $1,500,000, of which $700,000 is reserved to retire underlying bonds. (Aug. 3, p. 532.)

Grand Trunk.—At a special meeting of the stockholders at London, Dec. 11, the purchase was ratified of the Chicago & Grand Trunk, which has been reorganized as the Grand Trunk Western. John Bell & Co. give notice of an application to the Dominion Parliament for an act to confirm the agreement made between the two companies. (G. T. W., Nov. 30, p. 802.)

Lake Superior & Ishpeming.—Forty first mortgage bonds for $1,000 each have been drawn for payment at 105 and accrued interest on Jan. 1, 1901. They are secured by mortgage to the Farmers' Loan & Trust Co.

Montana.—A mortgage has been made to secure $2,000,000 first mortgage 30-year 5 per cent. gold bonds, due July 1, 1930, interest payable January and July at the Central Trust Co., New York, trustee. Of the total, $999,000 are stamped as redeemable at 105 and accrued interest, on six months' notice. All the bonds are outstanding and from the proceeds $1,500,000 first consolidated mortgage bonds dated July 1, 1896, were redeemed.

Nashville, Chattanooga & St. Louis.—One thousand general second mortgage bonds, 20 Tracy City branch bonds, and 114 Bon Air branch bonds for $1,000, have been called for payment at the Continental National Bank, New York, on and after Jan. 2, 1901, interest to cease Jan. 1. Hallgarten & Co., New York, offer for a limited period, to exchange the above bonds for the first consolidated mortgage 5 per cent. gold bonds, due 1928.

New York & Harlem.—The Appellate Division of the New York Supreme Court, on Dec. 7, handed down a decision reversing the order of the lower court, in which the Tax Commissioners were directed to strike from the rolls an assessment of $7,660,000. The railroad company claims that the real estate so assessed should be exempt because already assessed under the franchise tax law.

Northern Pacific.—The officers of the Province of Manitoba are reported to have decided to buy the Northern Pacific lines in the Province if they cannot be leased.

St. Louis & San Francisco.—A. G. Edwards & Son, and the Mississippi Valley Trust Co., both of St. Louis, have been offering at 92 and accrued interest $250,000 of the Northwestern Division first mortgage 30-year 4 per cent. gold bonds, dated April 1, 1900. The total authorized issue is $1,300,000, of which $1,100,000 is issued. The Continental Trust Co., New York, is trustee.

Southern.—Amended articles of incorporation were filed in Illinois, Dec. 10, permitting this company to operate the Louisville, Evansville & St. Louis Consolidated which has recently been taken over. (L., E. & St. L. C., Dec. 7, p. 818.)

Wheeling Traction.—According to press reports, a consolidation has been effected under this title of the Wheeling Ry., the Citizens' Ry., the Moundsville & Wheeling and the Belair, Bridgeport & Martin's Ferry, all operated in Wheeling, W. Va., and its vicinity.